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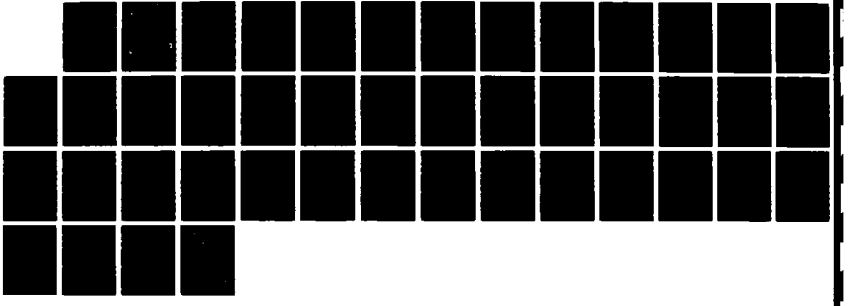

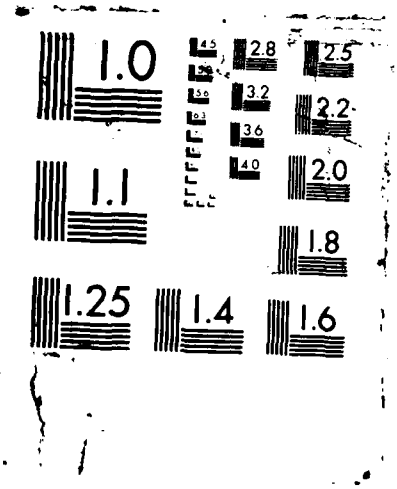
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AD-A190 132

TECHNICAL PUBLICATION TP000045

TIDAL AND LUNAR DATA FOR POINT MUGU, SAN NICOLAS ISLAND, AND THE BARKING SANDS AREA DURING 1988

COMPILED BY
RICH DIXON
GEOPHYSICS DIVISION

31 DECEMBER 1987

DTIC ELECTE JAN 11 1988 S D E

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PACIFIC MISSILE TEST CENTER
Point Mugu, California 93042

PACIFIC MISSILE TEST CENTER

AN ACTIVITY OF THE NAVAL AIR SYSTEMS COMMAND

MR. M. J. BURKHARDT, Head, Geophysical Instrumentation Branch; MR. R. W. DIXON, Task Engineer; LCDR T. D. SNOW, Geophysics Officer; MR. R. C. SMITH, Associate Range Operations Officer; and CAPT N. S. FLYNN, Director, Range Directorate, have approved this report for publication.

OPSEC review by MR. M. FLORES.

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

Basic lunar and tidal data for Point Mugu, San Nicolas Island, and the Barking Sands Area during 1988 are provided. The data presented are (1) Tidal data, (2) times of moonrise and moonset, (3) time of lunar phases, and (4) times of sunrise and sunset.

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CONTENTS

	Page
INTRODUCTION	1
DATA SOURCE AND TIME REFERENCES	1
TIDAL DATA	2
LUNAR DATA	2
APPENDIXES	
A-1. Height of the Tide at Any Time	A-1
B-1. Equinoxes, Solstices, and Lunar Phases During 1988	B-1
C-1. Sunrise and Sunset Tables	C-1
TABLES	
1. Tidal Ranges for Point Mugu and San Nicolas Island	2
2. Tidal Ranges for Port Allen	2
3. Moonrise and Moonset, Point Mugu, 1988	3
4. Point Mugu Tides, January 1988	4
5. San Nicolas Island Tides, January 1988	4
6. Point Mugu Tides, February 1988	5
7. San Nicolas Island Tides, February 1988	5
8. Point Mugu Tides, March 1988	6
9. San Nicolas Island Tides, March 1988	6
10. Point Mugu Tides, April 1988	7
11. San Nicolas Island Tides, April 1988	7
12. Point Mugu Tides, May 1988	8
13. San Nicolas Island Tides, May 1988	8
14. Point Mugu Tides, June 1988	9
15. San Nicolas Island Tides, June 1988	9
16. Point Mugu Tides, July 1988	10
17. San Nicolas Island Tides, July 1988	10
18. Point Mugu Tides, August 1988	11
19. San Nicolas Island Tides, August 1988	11
20. Point Mugu Tides, September 1988	12
21. San Nicolas Island Tides, September 1988	12
22. Point Mugu Tides, October 1988	13
23. San Nicolas Island Tides, October 1988	13
24. Point Mugu Tides, November 1988	14
25. San Nicolas Island Tides, November 1988	14
26. Point Mugu Tides, December 1988	15
27. San Nicolas Island Tides, December 1988	15
28. Moonrise and Moonset, Barking Sands 1988	16
29. Port Allen Tides, January 1988	17
30. Port Allen Tides, February 1988	18

CONTENTS (Concluded)

		Page
TABLES (Concluded)		
31.	Port Allen Tides, March 1988	18
32.	Port Allen Tides, April 1988	18
33.	Port Allen Tides, May 1988	19
34.	Port Allen Tides, June 1988	19
35.	Port Allen Tides, July 1988	20
36.	Port Allen Tides, August 1988	20
37.	Port Allen Tides, September 1988	21
38.	Port Allen Tides, October 1988	21
39.	Port Allen Tides, November 1988	22
40.	Port Allen Tides, December 1988	22
A-1.	Height of the Tide at Any Time	A-1
B-1.	Equinoxes, solstices, and Lunar Phases 1988	B-1
C-1.	Sunrise and Sunset for Point Mugu	C-2
C-2.	Sunrise and Sunset for Barking Sands	C-3
FIGURES		
A-1.	Tidal Curve for Solution of the Problem	A-3

INTRODUCTION

This publication combines into a single source all tidal and lunar data for operational locations of the Pacific Missile Test Center for use in Calendar Year 1988.

The data presentations are in two main divisions: one for Point Mugu and San Nicolas Island, and the other for the Barking Sands area. Within each division, the times of moonrise and moonset and tidal data are given. Appendixes provide information on lunar phases, sunrise and sunset times and calculation of the tide at any time. This publication is issued annually. Information regarding this data may be obtained from the Geophysics Division of the Range Operations Department.

DATA SOURCE AND TIME REFERENCES

The data given here have been prepared from information contained in Tide Tables for the West Coast of North and South America including the Hawaiian Islands, 1988, published by the National Ocean Service.

For Point Mugu and San Nicolas Island, all times listed are Pacific Standard Time (PST); add eight hours to obtain Universal Coordinated Time (UCT or Z). When Daylight Savings Time (PDT) is in effect, 1 hour is to be added to the times given. In 1988, Pacific Daylight Time is scheduled to commence at 0200 PST on Sunday 3 April, and to end at 0200 PDT on Sunday 30 October.

For the Barking Sands Area, all times listed are Alaska-Hawaii Standard Time (AHST); add ten hours to obtain UCT. Daylight Savings Time is not observed in Hawaii.

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TIDAL DATA

The ranges of tidal heights that may be expected at Point Mugu and San Nicolas Island are shown in table 1. The range of heights for the primary harbor in the Barking Sands area, Port Allen, is shown in table 2. The times and height of high and low tides for 1988 at Point Mugu are given in the even-numbered tables 4 through 26, and at San Nicolas Island in the odd-numbered tables 5 through 27. Similar tide data for Port Allen are given in tables 29 through 40.

Table 1. Tidal ranges for Point Mugu and San Nicolas Island

Tidal Levels	Point Mugu Height (Ft)	San Nicolas Is. Height (Ft)
Extreme high water	7.3	6.7
Mean higher high water	5.3	4.9
Mean high water	4.5	4.1
Mean tide level (mean sea level)	2.7	2.5
Mean low water	0.9	0.8
Mean lower low water	0.0	0.0
Extreme low water	-2.0	-1.8

Table 2. Tidal Ranges for Port Allen

Tidal Levels	Height (Ft)
Extreme high water	2.6
Mean higher high water	1.6
Mean high water	1.2
Mean tide level (mean sea level)	0.7
Mean low water	0.2
Mean lower low water	0.0
Extreme low water	-0.4

These tables list the times and heights of high and low tide for each month of the year and chronologically through each day. The heights are all measured from mean lower low water and are values for a sea unaffected by wind waves or swell. The height and character of the sea surface are influenced by factors other than the predictable positions of the moon and sun, and thus are likely to be higher or lower than computed values indicate.

LUNAR DATA

Times of moonrise and moonset for the Point Mugu-San Nicolas Island area in 1988 are given in table 3, and for the Barking Sands area in table 28, preceding the tidal data for the respective stations. Information regarding the phases of the moon in 1988 is found in appendix B.

Table 3 - NAS Point Mugu, California

Moonrise and Moonset for 1988

Pacific Standard Time

Nautical Almanac Office
U.S. Naval Observatory
Washington, D.C. 20392-5100

Day	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	1451	0513	1628	0629	1619	0536	1758	0518	1851	0439	2100	0528	2117	0641	2123	0912	2138	1135	2204	1233	2355	1315		1233
2	1542	0612	1728	0703	1716	0603	1857	0542	1958	0512	2155	0633	2153	0756	2152	1022	2224	1243	2304	1325		1343	0034	1256
3	1633	0705	1826	0733	1812	0627	1958	0608	2105	0552	2241	0744	2224	0908	2224	1130	2316	1345		1408	0052	1408	0129	1320
4	1736	0750	1922	0759	1909	0651	2102	0638	2210	0641	2319	0857	2253	1018	2300	1239		1441	0005	1444	0148	1431	0225	1345
5	1836	0829	2018	0823	2006	0714	2208	0712	2308	0739	2352	1009	2321	1125	2340	1346	0013	1528	0105	1514	0243	1454	0323	1412
6	1935	0901	2114	0846	2104	0738	2314	0754	2359	0844		1118	2351	1232		1451	0112	1608	0204	1540	0339	1518	0424	1445
7	2032	0933	2211	0909	2206	0805		0845		0955	0022	1226		1339	0028	1551	0213	1642	0300	1605	0436	1544	0528	1523
8	2128	0955	2311	0934	2310	0835	0016	0945	0042	1106	0050	1332	0023	1446	0121	1644	0312	1711	0356	1628	0535	1613	0632	1610
9	2224	1019		1002		0911	0113	1052	0118	1217	0118	1439	0100	1553	0219	1729	0410	1736	0451	1651	0637	1647	0735	1707
10	2321	1042	0013	1034	0016	0956	0201	1203	0150	1326	0148	1547	0142	1657	0319	1807	0506	1800	0547	1715	0741	1729	0833	1811
11		1106	0119	1114	0121	1050	0242	1316	0219	1434	0222	1655	0231	1755	0419	1839	0602	1823	0645	1741	0845	1818	0924	1920
12	0019	1132	0227	1202	0223	1153	0317	1428	0247	1542	0301	1802	0326	1846	0519	1907	0657	1846	0744	1812	0945	1916	1007	2031
13	0121	1202	0334	1302	0318	1304	0348	1539	0316	1650	0346	1905	0426	1929	0616	1932	0753	1910	0847	1847	1040	2020	1043	2140
14	0227	1238	0435	1412	0405	1420	0418	1649	0348	1800	0438	2002	0527	2006	0712	1955	0851	1938	0950	1930	1127	2129	1115	2249
15	0336	1323	0529	1529	0445	1535	0447	1759	0424	1909	0535	2051	0627	2036	0807	2018	0951	2009	1052	2022	1207	2239	1145	2356
16	0447	1419	0614	1647	0520	1649	0518	1909	0506	2016	0636	2132	0726	2103	0902	2041	1053	2047	1150	2121	1242	2348	1213	
17	0554	1527	0652	1803	0551	1801	0552	2020	0554	2118	0737	2206	0823	2128	0959	2106	1157	2132	1243	2227	1313		1242	0103
18	0653	1642	0725	1916	0621	1912	0630	2129	0649	2212	0837	2235	0918	2151	1057	2135	1259	2227	1328	2337	1342	0056	1314	0211
19	0743	1800	0755	2027	0651	2023	0715	2234	0748	2257	0935	2301	1013	2214	1159	2208	1357	2330	1407		1411	0205	1350	0321
20	0824	1917	0825	2137	0723	2133	0806	2332	0849	2335	1031	2325	1109	2238	1303	2249	1448		1441	0049	1442	0314	1433	0431
21	0859	2030	0855	2245	0758	2242	0902		0949		1127	2348	1207	2304	1408	2339	1533	0041	1513	0200	1516	0425	1522	0540
22	0923	2140	0927	2353	0839	2348	1001	0021	1048	0007	1222		1308	2335	1511		1611	0154	1543	0311	1555	0537	1619	0645
23	0958	2248	1004		0925		1101	0103	1145	0035	1320	0012	1412		1608	0040	1645	0309	1613	0422	1642	0649	1721	0741
24	1026	2354	1045	0059	1017	0049	1201	0138	1241	0100	1420	0037	1519	0013	1658	0149	1716	0422	1646	0534	1735	0758	1825	0829
25	1056		1132	0201	1114	0142	1259	0208	1337	0123	1523	0106	1625	0059	1741	0304	1747	0535	1723	0648	1835	0900	1928	0908
26	1129	0059	1225	0257	1213	0227	1356	0234	1434	0147	1630	0140	1727	0155	1817	0421	1818	0648	1806	0801	1938	0953	2029	0941
27	1206	0204	1322	0347	1312	0306	1452	0258	1533	0211	1739	0222	1823	0302	1850	0536	1853	0801	1855	0913	2041	1036	2127	1009
28	1248	0308	1421	0429	1411	0338	1549	0321	1636	0238	1844	0313	1909	0416	1921	0650	1932	0914	1951	1018	2143	1112	2223	1034
29	1337	0407	1521	0505	1508	0406	1647	0345	1742	0309	1944	0416	1949	0532	1951	0802	2016	1026	2052	1115	2242	1143	2318	1058
30	1431	0501			1605	0431	1747	0410	1850	0347	2035	0526	2023	0648	2023	0913	2107	1133	2154	1203	2338	1209		1121
31	1529	0549			1701	0455			1957	0433			2053	0801	2058	1025			2255	1242			0013	1145

Table 4

POINT MUGU TIDES
JANUARY 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0039	2.4	0657	6.0	1434	-.8	2107	3.5
2	0121	2.4	0732	6.0	1509	-.9	2142	3.5
3	0200	2.4	0808	6.0	1542	-.9	2214	3.6
4	0232	2.4	0842	6.0	1614	-.8	2244	3.6
5	0308	2.4	0914	5.8	1646	-.6	2316	3.6
6	0344	2.4	0946	5.5	1715	-.4	2348	3.6
7	0423	2.4	1018	5.2	1746	-.1	----	---
8	0020	3.6	0507	2.4	1054	4.7	1812	.3
9	0055	3.7	0606	2.5	1132	4.1	1840	.8
10	0130	3.9	0720	2.4	1218	3.5	1912	1.2
11	0212	4.1	0856	2.2	1340	2.9	1943	1.6
12	0258	4.3	1036	1.6	1555	2.5	2029	2.0
13	0346	4.7	1145	1.0	1804	2.7	2138	2.3
14	0439	5.1	1236	.2	1915	3.0	2247	2.5
15	0530	5.6	1321	-.5	1957	3.3	2356	2.5
16	0618	6.0	1404	-1.1	2036	3.5	----	---
17	0052	2.3	0707	6.4	1440	-1.5	2110	3.7
18	0143	2.1	0755	6.7	1523	-1.7	2146	3.9
19	0234	1.8	0841	6.8	1602	-1.7	2224	4.1
20	0325	1.6	0927	6.6	1641	-1.5	2304	4.3
21	0418	1.4	1015	6.1	1720	-1.1	2342	4.5
22	0518	1.4	1107	5.4	1759	-.4	----	---
23	0025	4.7	0624	1.4	1203	4.5	1837	.3
24	0112	4.8	0744	1.3	1312	3.6	1918	1.1
25	0205	4.9	0920	1.2	1457	2.9	2007	1.7
26	0305	5.0	1058	.8	1720	2.7	2110	2.3
27	0411	5.1	1212	.2	1902	3.0	2237	2.6
28	0514	5.2	1307	-.2	1956	3.3	2351	2.6
29	0604	5.4	1350	-.5	2031	3.5	----	---
30	0047	2.5	0649	5.6	1425	-.7	2100	3.6
31	0126	2.3	0727	5.7	1456	-.8	2124	3.6

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 5

SAN NICOLAS ISLAND TIDES
JANUARY 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0036	2.2	0710	5.5	1431	-.7	2120	3.2
2	0118	2.2	0745	5.5	1506	-.8	2155	3.2
3	0157	2.2	0821	5.5	1539	-.8	2227	3.3
4	0229	2.2	0855	5.5	1611	-.7	2257	3.3
5	0305	2.2	0927	5.3	1643	-.5	2329	3.3
6	0341	2.2	0959	5.0	1712	-.4	0001	3.3*
7	0420	2.2	1031	4.8	1743	-.1	----	---
8	0033	3.3	0504	2.2	1107	4.3	1809	.3
9	0108	3.4	0603	2.3	1145	3.8	1837	.7
10	0143	3.6	0717	2.2	1231	3.2	1909	1.1
11	0225	3.8	0853	2.0	1353	2.6	1940	1.5
12	0311	4.0	1033	1.5	1608	2.3	2026	1.8
13	0359	4.3	1142	.9	1817	2.5	2135	2.1
14	0452	4.7	1233	.2	1928	2.7	2244	2.3
15	0543	5.1	1318	-.4	2010	3.0	2353	2.3
16	0631	5.5	1401	-1.0	2049	3.2	----	---
17	0049	2.1	0720	5.9	1437	-1.4	2123	3.4
18	0140	1.9	0808	6.2	1520	-1.6	2159	3.6
19	0231	1.7	0854	6.2	1559	-1.6	2237	3.8
20	0322	1.5	0940	6.1	1638	-1.4	2317	4.0
21	0415	1.3	1028	5.6	1717	-1.0	2355	4.1
22	0515	1.3	1120	4.9	1756	-.4	----	---
23	0038	4.3	0621	1.3	1216	4.1	1834	.3
24	0125	4.4	0741	1.2	1325	3.3	1915	1.0
25	0218	4.5	0917	1.1	1510	2.6	2004	1.6
26	0318	4.6	1055	.7	1733	2.5	2107	2.1
27	0424	4.7	1209	.2	1915	2.7	2234	2.4
28	0527	4.8	1304	-.2	2009	3.0	2348	2.4
29	0617	4.9	1347	-.4	2044	3.2	----	---
30	0044	2.3	0702	5.1	1422	-.6	2113	3.3
31	0123	2.1	0740	5.2	1453	-.7	2137	3.3

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 6

POINT MUGU TIDES
FEBRUARY 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0204	2.1	0802	5.8	1522	-.8	2143	3.7
2	0233	2.0	0834	5.8	1548	-.7	2205	3.8
3	0306	1.8	0903	5.6	1611	-.5	2227	3.9
4	0338	1.7	0934	5.4	1636	-.3	2248	4.0
5	0414	1.6	1004	5.0	1657	.1	2314	4.1
6	0452	1.6	1036	4.5	1715	.5	2339	4.2
7	0535	1.6	1110	3.9	1734	1.0	----	---
8	0004	4.2	0631	1.6	1155	3.3	1755	1.3
9	0037	4.3	0750	1.6	1304	2.6	1810	1.8
10	0125	4.4	0940	1.3	----	---	----	---
11	0233	4.5	1119	.8	----	---	----	---
12	0357	4.9	1218	0.0	1927	3.0	2232	2.8
13	0508	5.3	1305	-.7	1949	3.4	2354	2.5
14	0607	5.9	1344	-1.2	2014	3.6	----	---
15	0054	2.0	0658	6.2	1423	-1.5	2042	4.0
16	0145	1.5	0746	6.5	1459	-1.6	2113	4.4
17	0232	1.1	0835	6.5	1534	-1.4	2143	4.7
18	0322	.7	0921	6.2	1608	-1.1	2218	5.0
19	0411	.5	1006	5.7	1643	-.6	2253	5.2
20	0507	.4	1058	4.8	1715	.2	2331	5.2
21	0602	.5	1151	3.9	1747	.9	----	---
22	0010	5.1	0714	.7	1306	3.1	1819	1.6
23	0101	4.9	0847	.7	1511	2.6	1851	2.2
24	0205	4.7	1031	.6	----	---	----	---
25	0332	4.6	1156	.2	1919	3.2	2247	2.9
26	0451	4.7	1249	-.1	1951	3.5	0004	2.6*
27	0554	4.9	1328	-.4	2009	3.6	----	---
28	0049	2.3	0639	5.1	1401	-.5	2027	3.7
29	0126	2.0	0718	5.3	1426	-.6	2046	3.8

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 7

SAN NICOLAS ISLAND TIDES
FEBRUARY 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0201	1.9	0815	5.3	1519	-.7	2156	3.4
2	0230	1.8	0847	5.3	1545	-.6	2218	3.5
3	0303	1.7	0916	5.1	1608	-.4	2240	3.6
4	0335	1.6	0947	4.9	1633	-.3	2301	3.7
5	0411	1.5	1017	4.6	1654	.1	2327	3.8
6	0449	1.5	1049	4.1	1712	.4	2352	3.9
7	0532	1.5	1123	3.6	1731	.9	----	---
8	0017	3.9	0628	1.5	1208	3.0	1752	1.2
9	0050	4.0	0747	1.5	1317	2.4	1807	1.7
10	0138	4.0	0937	1.2	----	---	----	---
11	0246	4.1	1116	.7	----	---	----	---
12	0410	4.5	1215	0.0	1940	2.7	2229	2.6
13	0521	4.8	1302	-.6	2002	3.1	2351	2.3
14	0620	5.4	1341	-1.1	2027	3.3	----	---
15	0051	1.8	0711	5.7	1420	-1.4	2055	3.7
16	0142	1.4	0759	6.0	1456	-1.5	2126	4.0
17	0229	1.0	0848	6.0	1531	-1.3	2156	4.3
18	0319	.6	0934	5.7	1605	-1.0	2231	4.6
19	0408	.4	1019	5.2	1640	-.5	2306	4.8
20	0504	.4	1111	4.4	1712	.2	2344	4.8
21	0559	.4	1204	3.6	1744	.8	----	---
22	0023	4.7	0711	.6	1319	2.8	1816	1.5
23	0114	4.5	0844	.6	1524	2.4	1848	2.0
24	0218	4.3	1028	.5	----	---	----	---
25	0345	4.2	1153	.2	1932	2.9	2244	2.6
26	0504	4.3	1246	-.1	2004	3.2	0001	2.4*
27	0607	4.5	1325	-.4	2022	3.3	----	---
28	0046	2.1	0652	4.7	1358	-.4	2040	3.4
29	0123	1.8	0731	4.8	1423	-.5	2059	3.5

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 8

POINT MUGU TIDES
MARCH 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0155	1.6	0750	5.4	1450	-.5	2101	4.0
2	0226	1.3	0819	5.3	1512	-.1	2119	4.2
3	0258	1.2	0850	5.2	1531	-.2	2137	4.3
4	0327	1.0	0919	4.9	1551	.1	2156	4.5
5	0359	.8	0951	4.5	1608	.5	2216	4.6
6	0438	.8	1026	4.0	1628	.9	2236	4.7
7	0515	.8	1102	3.5	1644	1.3	2302	4.7
8	0605	.9	1154	3.0	1659	1.7	2334	4.7
9	0717	.9	1322	2.4	1657	2.1	----	---
10	0024	4.6	0901	.8	----	---	----	---
11	0145	4.5	1045	.4	----	---	----	---
12	0328	4.6	1148	-.2	1858	3.3	2250	2.7
13	0454	5.0	1236	-.7	1916	3.6	0001	2.2*
14	0557	5.5	1314	-1.1	1938	4.0	----	---
15	0054	1.5	0649	5.8	1352	-1.2	2003	4.5
16	0143	.8	0738	6.0	1424	-1.1	2032	5.0
17	0228	.2	0827	5.8	1457	-.8	2103	5.3
18	0314	-.2	0913	5.4	1529	-.3	2135	5.6
19	0401	-.5	1001	4.8	1601	.3	2206	5.7
20	0451	-.5	1051	4.1	1629	1.0	2242	5.6
21	0547	-.3	1150	3.5	1701	1.5	2318	5.3
22	0648	.1	1309	2.9	1726	2.1	----	---
23	0003	4.8	0812	.4	----	---	----	---
24	0104	4.4	0955	.4	----	---	----	---
25	0244	4.1	1116	.2	1850	3.4	2250	2.9
26	0422	4.1	1209	0.0	1905	3.6	2359	2.5
27	0528	4.3	1246	-.1	1923	3.7	----	---
28	0039	2.0	0617	4.5	1318	-.1	1938	3.9
29	0111	1.6	0656	4.7	1343	-.1	1956	4.2
30	0141	1.2	0729	4.7	1405	0.0	2011	4.4
31	0210	.8	0803	4.6	1423	.2	2029	4.6

* -- TIDE OCCURS ON NEXT DATE
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 9

SAN NICOLAS ISLAND TIDES
MARCH 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0152	1.5	0803	4.9	1447	-.4	2114	3.7
2	0223	1.2	0832	4.8	1509	-.1	2132	3.9
3	0255	1.1	0903	4.8	1528	-.2	2150	4.0
4	0324	.9	0932	4.5	1548	.1	2209	4.1
5	0356	.7	1004	4.1	1605	.4	2229	4.2
6	0435	.7	1039	3.7	1625	.8	2249	4.3
7	0512	.7	1115	3.2	1641	1.2	2315	4.3
8	0602	.8	1207	2.7	1656	1.6	2347	4.3
9	0714	.8	1335	2.2	1654	1.9	----	---
10	0037	4.2	0858	.7	----	---	----	---
11	0158	4.1	1042	.4	----	---	----	---
12	0341	4.2	1145	-.2	1911	3.0	2247	2.5
13	0507	4.6	1233	-.6	1929	3.3	2358	2.0
14	0610	5.0	1311	-1.0	1951	3.7	----	---
15	0051	1.4	0702	5.3	1349	-1.1	2016	4.1
16	0140	.7	0751	5.5	1421	-1.0	2045	4.6
17	0225	.2	0840	5.3	1454	-.7	2116	4.8
18	0311	-.2	0926	4.9	1526	-.3	2148	5.1
19	0358	-.4	1014	4.4	1558	.3	2219	5.2
20	0448	-.4	1104	3.8	1626	.9	2255	5.1
21	0544	-.3	1203	3.2	1658	1.4	2331	4.8
22	0645	.1	1322	2.6	1723	1.9	----	---
23	0016	4.4	0809	.4	----	---	----	---
24	0117	4.0	0952	.4	----	---	----	---
25	0257	3.8	1113	.2	1903	3.1	2247	2.6
26	0435	3.8	1206	0.0	1918	3.3	2356	2.3
27	0541	4.0	1243	-.1	1936	3.4	----	---
28	0036	1.8	0630	4.1	1315	-.1	1951	3.6
29	0108	1.5	0709	4.3	1340	-.1	2009	3.9
30	0138	1.1	0742	4.3	1402	0.0	2024	4.0
31	0207	.7	0816	4.2	1420	.2	2042	4.2

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 10

POINT MUGU TIDES
APRIL 1986
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0242	.5	0836	4.5	1443	.5	2047	4.9
2	0314	.2	0911	4.2	1503	.8	2106	5.0
3	0347	0.0	0945	3.9	1523	1.1	2127	5.1
4	0422	-.1	1026	3.6	1543	1.4	2153	5.2
5	0504	0.0	1115	3.2	1602	1.8	2221	5.1
6	0600	.1	1219	2.7	1617	2.1	2302	5.0
7	0706	.2	2355	4.7	----	---	----	---
8	0837	.2	----	---	----	---	----	---
9	0120	4.5	1003	0.0	1754	3.2	2113	3.0
10	0306	4.4	1107	-.3	1809	3.6	2258	2.4
11	0436	4.6	1153	-.5	1830	4.1	0001	1.6*
12	0543	4.9	1235	-.6	1855	4.6	----	---
13	0052	.9	0640	5.0	1311	-.4	1923	5.1
14	0137	.1	0731	5.0	1346	-.2	1952	5.6
15	0222	-.5	0821	4.7	1418	.2	2024	5.9
16	0308	-.9	0910	4.4	1450	.7	2056	6.0
17	0353	-1.1	1002	4.0	1522	1.2	2128	6.0
18	0439	-1.0	1054	3.6	1550	1.6	2201	5.7
19	0528	-.7	1155	3.2	1619	2.1	2238	5.3
20	0627	-.3	1319	2.9	1648	2.5	2322	4.8
21	0738	0.0	----	---	----	---	----	---
22	0018	4.3	0858	.2	1727	3.2	1957	3.1
23	0143	3.9	1010	.3	1749	3.5	2223	2.9
24	0326	3.8	1108	.3	1809	3.7	2330	2.4
25	0442	3.8	1148	.3	1826	3.9	----	---
26	0016	1.8	0538	3.9	1219	.4	1845	4.2
27	0048	1.3	0625	3.9	1244	.6	1900	4.5
28	0124	.8	0709	3.9	1310	.8	1919	4.8
29	0152	.4	0747	3.9	1334	1.0	1937	5.1
30	0224	-.1	0826	3.8	1356	1.2	2002	5.4

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 11

SAN NICOLAS ISLAND TIDES
APRIL 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0239	.4	0849	4.1	1440	.4	2100	4.5
2	0311	.2	0924	3.9	1500	.7	2119	4.6
3	0344	0.0	0958	3.6	1520	1.0	2140	4.7
4	0419	-.1	1039	3.3	1540	1.3	2206	4.8
5	0501	0.0	1128	2.9	1559	1.7	2234	4.7
6	0557	.1	1232	2.5	1614	1.9	2315	4.6
7	0703	.2	0008	4.3	----	---	----	---
8	0834	.2	----	---	----	---	----	---
9	0133	4.1	1000	0.0	1807	2.9	2110	2.7
10	0319	4.0	1104	-.3	1822	3.3	2255	2.2
11	0449	4.2	1150	-.4	1843	3.8	2358	1.5
12	0556	4.5	1232	-.5	1908	4.2	----	---
13	0049	.8	0653	4.6	1308	-.4	1936	4.7
14	0134	.1	0744	4.6	1343	-.2	2005	5.1
15	0219	-.4	0834	4.3	1415	.2	2037	5.4
16	0305	-.8	0923	4.0	1447	.6	2109	5.5
17	0350	-1.0	1015	3.7	1519	1.1	2141	5.5
18	0436	-.9	1107	3.3	1547	1.5	2214	5.2
19	0525	-.6	1208	2.9	1616	1.9	2251	4.8
20	0624	-.3	1332	2.6	1645	2.3	2335	4.4
21	0735	0.0	----	---	----	---	----	---
22	0031	4.0	0855	.2	1740	2.9	1954	2.8
23	0156	3.6	1007	.3	1802	3.2	2220	2.6
24	0339	3.5	1105	.3	1822	3.4	2327	2.2
25	0455	3.5	1145	.3	1839	3.6	----	---
26	0013	1.7	0551	3.6	1216	.4	1858	3.9
27	0045	1.2	0638	3.6	1241	.5	1913	4.1
28	0121	.7	0722	3.6	1307	.7	1932	4.4
29	0149	.4	0800	3.6	1331	.9	1950	4.7
30	0221	-.1	0839	3.5	1353	1.1	2015	4.9

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 12

POINT MUGU TIDES
MAY 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0300	-.4	0908	3.6	1417	1.4	2024	5.6
2	0335	-.6	0951	3.5	1446	1.7	2053	5.7
3	0417	-.7	1041	3.3	1511	2.0	2127	5.7
4	0505	-.7	1136	3.1	1540	2.3	2204	5.5
5	0559	-.6	1256	2.9	1615	2.5	2249	5.3
6	0659	-.5	1433	3.0	1718	2.8	2352	4.9
7	0812	-.4	1548	3.3	1920	3.0	----	---
8	0114	4.5	0917	-.3	1634	3.6	2126	2.7
9	0248	4.2	1015	-.2	1708	4.1	2252	1.9
10	0418	4.1	1104	0.0	1740	4.7	2354	1.2
11	0530	4.1	1149	.2	1810	5.2	----	---
12	0047	.3	0633	4.0	1228	.6	1844	5.7
13	0132	-.4	0731	3.9	1303	.9	1916	6.0
14	0218	-.9	0825	3.8	1337	1.2	1950	6.1
15	0302	-1.2	0916	3.6	1414	1.6	2022	6.1
16	0345	-1.2	1009	3.5	1446	1.9	2058	6.0
17	0431	-1.1	1102	3.3	1521	2.2	2133	5.8
18	0515	-.9	1203	3.2	1556	2.5	2212	5.4
19	0606	-.5	1312	3.1	1636	2.7	2254	5.0
20	0659	-.2	1433	3.2	1741	3.0	2342	4.5
21	0759	.1	1542	3.4	1917	3.1	----	---
22	0048	4.0	0856	.4	1624	3.6	2118	2.9
23	0210	3.6	0945	.6	1656	3.8	2245	2.4
24	0336	3.5	1031	.8	1720	4.1	2341	1.8
25	0452	3.3	1103	1.1	1740	4.5	----	---
26	0023	1.2	0554	3.3	1137	1.2	1804	4.8
27	0102	.7	0650	3.3	1209	1.5	1826	5.2
28	0137	.1	0737	3.4	1238	1.7	1854	5.5
29	0212	-.4	0826	3.4	1310	1.9	1924	5.8
30	0250	-.8	0912	3.4	1342	2.0	1957	6.0
31	0330	-1.1	0958	3.4	1420	2.2	2035	6.1

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 13

SAN NICOLAS ISLAND TIDES
MAY 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0257	-.4	0921	3.3	1414	1.3	2037	5.1
2	0332	-.5	1004	3.2	1443	1.6	2106	5.2
3	0414	-.6	1054	3.0	1508	1.8	2140	5.2
4	0502	-.6	1149	2.8	1537	2.1	2217	5.0
5	0555	-.5	1309	2.6	1612	2.3	2302	4.8
6	0656	-.4	1446	2.7	1715	2.6	0005	4.5*
7	0809	-.4	1601	3.0	1917	2.7	----	---
8	0127	4.1	0914	-.3	1647	3.3	2123	2.5
9	0301	3.9	1012	-.2	1721	3.8	2249	1.8
10	0431	3.8	1101	0.0	1753	4.3	2351	1.1
11	0543	3.8	1146	.2	1823	4.8	----	---
12	0044	.3	0646	3.7	1225	.5	1857	5.2
13	0129	-.4	0744	3.6	1300	.8	1929	5.5
14	0215	-.8	0838	3.5	1334	1.1	2003	5.6
15	0259	-1.1	0929	3.3	1411	1.5	2035	5.6
16	0342	-1.1	1022	3.2	1443	1.8	2111	5.5
17	0428	-1.0	1115	3.0	1518	2.0	2146	5.3
18	0512	-.8	1216	2.9	1553	2.3	2225	4.9
19	0603	-.4	1325	2.8	1633	2.5	2307	4.6
20	0656	-.2	1446	2.9	1738	2.7	2355	4.1
21	0756	.1	1555	3.1	1914	2.8	----	---
22	0101	3.7	0853	.4	1637	3.3	2115	2.6
23	0223	3.3	0942	.5	1709	3.5	2242	2.2
24	0349	3.2	1028	.7	1733	3.6	2338	1.7
25	0505	3.0	1100	1.0	1753	4.1	----	---
26	0020	1.1	0607	3.0	1134	1.1	1817	4.4
27	0059	.6	0703	3.0	1206	1.4	1839	4.8
28	0134	.1	0750	3.1	1235	1.6	1907	5.0
29	0209	-.4	0839	3.1	1307	1.8	1937	5.3
30	0247	-.7	0925	3.1	1339	1.8	2010	5.5
31	0327	-1.0	1011	3.1	1417	2.0	2048	5.6

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 14

POINT MUGU TIDES
JUNE 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0412	-1.2	1049	3.4	1457	2.3	2115	6.0
2	0502	-1.2	1144	3.4	1545	2.5	2202	6.0
3	0551	-1.1	1244	3.4	1644	2.6	2254	5.6
4	0642	-.9	1343	3.6	1800	2.7	2353	5.1
5	0736	-.5	1439	3.8	1938	2.6	----	---
6	0106	4.5	0830	-.1	1528	4.2	2116	2.2
7	0232	3.9	0923	.3	1610	4.7	2240	1.5
8	0402	3.6	1011	.8	1652	5.2	2346	.8
9	0527	3.5	1100	1.2	1732	5.6	----	---
10	0044	0.0	0641	3.4	1146	1.5	1810	6.0
11	0134	-.6	0745	3.4	1228	1.8	1847	6.1
12	0219	-.9	0840	3.5	1310	2.1	1926	6.2
13	0301	-1.1	0929	3.5	1348	2.2	2003	6.1
14	0340	-1.1	1017	3.5	1430	2.4	2041	6.0
15	0422	-1.0	1057	3.5	1506	2.5	2120	5.9
16	0501	-.8	1142	3.4	1548	2.6	2155	5.6
17	0539	-.5	1234	3.5	1633	2.7	2234	5.2
18	0619	-.2	1316	3.5	1726	2.8	2313	4.7
19	0657	.1	1402	3.6	1837	2.9	0002	4.2*
20	0736	.5	1444	3.7	2005	2.7	----	---
21	0101	3.6	0815	1.0	1522	4.0	2139	2.4
22	0221	3.2	0854	1.3	1559	4.3	2258	1.8
23	0402	2.9	0936	1.6	1631	4.6	2353	1.2
24	0533	2.9	1021	1.9	1706	5.0	----	---
25	0039	.7	0647	3.0	1103	2.2	1742	5.4
26	0122	.1	0743	3.1	1153	2.3	1820	5.8
27	0200	-.5	0830	3.3	1238	2.4	1859	6.0
28	0241	-1.0	0914	3.5	1326	2.4	1942	6.3
29	0321	-1.2	0952	3.6	1412	2.3	2026	6.5
30	0403	-1.4	1034	3.7	1501	2.3	2112	6.5

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 15

SAN NICOLAS ISLAND TIDES
JUNE 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0409	-1.1	1102	3.1	1454	2.1	2128	5.5
2	0459	-1.1	1157	3.1	1542	2.3	2215	5.5
3	0548	-1.0	1257	3.1	1641	2.4	2307	5.1
4	0639	-.8	1356	3.3	1757	2.5	0006	4.7*
5	0733	-.4	1452	3.5	1935	2.4	----	---
6	0119	4.1	0827	-.1	1541	3.9	2113	2.0
7	0245	3.6	0920	.3	1623	4.3	2237	1.4
8	0415	3.3	1008	.7	1705	4.8	2343	.7
9	0540	3.2	1057	1.1	1745	5.1	----	---
10	0041	0.0	0654	3.1	1143	1.4	1823	5.5
11	0131	-.5	0758	3.1	1225	1.7	1900	5.6
12	0216	-.8	0853	3.2	1307	1.9	1939	5.7
13	0258	-1.0	0942	3.2	1345	2.0	2016	5.6
14	0337	-1.0	1030	3.2	1427	2.2	2054	5.5
15	0419	-.9	1110	3.2	1503	2.3	2133	5.4
16	0458	-.7	1155	3.1	1545	2.4	2208	5.1
17	0536	-.4	1247	3.2	1630	2.5	2247	4.8
18	0616	-.2	1329	3.2	1723	2.6	2326	4.3
19	0654	.1	1415	3.3	1834	2.6	0015	3.9*
20	0733	.4	1457	3.4	2002	2.5	----	---
21	0114	3.3	0812	.9	1535	3.7	2136	2.2
22	0234	2.9	0851	1.2	1612	4.0	2255	1.7
23	0415	2.6	0933	1.5	1644	4.2	2350	1.1
24	0546	2.6	1018	1.8	1719	4.6	----	---
25	0036	.6	0700	2.7	1100	2.0	1755	4.9
26	0119	.1	0756	2.8	1150	2.1	1833	5.3
27	0157	-.4	0843	3.0	1235	2.2	1912	5.5
28	0238	-.9	0927	3.2	1323	2.2	1955	5.8
29	0318	-1.1	1005	3.3	1409	2.1	2039	6.0
30	0400	-1.3	1047	3.4	1458	2.1	2125	6.0

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 16

POINT MUGU TIDES
JULY 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0445	-1.3	1120	3.8	1556	2.2	2200	6.3
2	0528	-1.2	1202	4.0	1654	2.2	2252	5.9
3	0611	-.8	1251	4.2	1803	2.1	2348	5.1
4	0656	-.2	1336	4.5	1925	2.0	----	---
5	0054	4.3	0741	.4	1425	4.9	2056	1.6
6	0216	3.6	0826	1.1	1517	5.2	2225	1.2
7	0400	3.2	0922	1.6	1608	5.5	2341	.5
8	0545	3.1	1018	2.1	1700	5.7	----	---
9	0043	-.1	0707	3.2	1120	2.4	1751	5.9
10	0132	-.5	0809	3.4	1217	2.5	1833	6.0
11	0217	-.8	0852	3.6	1302	2.5	1915	6.1
12	0256	-.9	0934	3.6	1347	2.5	1955	6.1
13	0331	-.9	1006	3.6	1426	2.4	2033	6.0
14	0404	-.8	1031	3.7	1505	2.4	2108	6.0
15	0432	-.6	1103	3.7	1540	2.4	2140	5.7
16	0504	-.3	1131	3.8	1620	2.4	2215	5.3
17	0530	0.0	1203	3.9	1705	2.4	2248	4.8
18	0558	.4	1232	4.0	1758	2.4	2326	4.3
19	0623	.9	1307	4.1	1859	2.4	----	---
20	0012	3.6	0652	1.3	1346	4.3	2026	2.2
21	0120	3.1	0720	1.8	1426	4.4	2205	1.8
22	0321	2.7	0752	2.2	1515	4.7	2325	1.2
23	0548	2.7	0848	2.6	1615	5.0	----	---
24	0020	.7	0708	3.0	1015	2.8	1708	5.4
25	0106	0.0	0751	3.3	1130	2.8	1759	5.9
26	0145	-.5	0823	3.6	1229	2.6	1846	6.3
27	0225	-1.0	0851	3.7	1321	2.3	1932	6.6
28	0302	-1.2	0927	4.0	1412	2.0	2021	6.8
29	0339	-1.3	1002	4.3	1503	1.8	2106	6.7
30	0417	-1.2	1036	4.5	1556	1.5	2152	6.3
31	0456	-.8	1113	4.8	1650	1.4	2245	5.8

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 17

SAN NICOLAS ISLAND TIDES
JULY 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0442	-1.2	1133	3.5	1553	2.0	2213	5.8
2	0525	-1.1	1215	3.7	1651	2.0	2305	5.4
3	0608	-.7	1304	3.9	1800	1.9	0001	4.7*
4	0653	-.2	1349	4.1	1922	1.8	----	---
5	0107	4.0	0738	.4	1438	4.5	2053	1.5
6	0229	3.3	0823	1.0	1530	4.8	2222	1.1
7	0413	2.9	0919	1.5	1621	5.0	2338	.4
8	0558	2.8	1015	1.9	1713	5.2	----	---
9	0040	-.1	0720	2.9	1117	2.2	1804	5.4
10	0129	-.4	0822	3.1	1214	2.3	1846	5.5
11	0214	-.7	0905	3.3	1259	2.3	1928	5.6
12	0253	-.8	0947	3.3	1344	2.3	2008	5.6
13	0328	-.8	1019	3.3	1423	2.2	2046	5.5
14	0401	-.7	1044	3.4	1502	2.2	2121	5.5
15	0429	-.5	1116	3.4	1537	2.2	2153	5.2
16	0501	-.3	1144	3.5	1617	2.2	2228	4.8
17	0527	0.0	1216	3.6	1702	2.2	2301	4.4
18	0555	.4	1245	3.7	1755	2.2	2339	4.0
19	0620	.8	1320	3.8	1856	2.2	----	---
20	0025	3.3	0649	1.2	1359	4.0	2023	2.0
21	0133	2.8	0717	1.7	1439	4.0	2202	1.7
22	0334	2.5	0749	2.0	1528	4.3	2322	1.1
23	0601	2.5	0845	2.4	1628	4.6	----	---
24	0017	.6	0721	2.7	1012	2.6	1721	4.9
25	0103	0.0	0804	3.0	1127	2.6	1812	5.4
26	0142	-.4	0836	3.3	1226	2.4	1859	5.8
27	0222	-.9	0904	3.4	1318	2.1	1945	6.1
28	0259	-1.1	0940	3.7	1409	1.8	2034	6.2
29	0336	-1.2	1015	4.0	1500	1.7	2119	6.2
30	0414	-1.1	1049	4.1	1553	1.4	2205	5.8
31	0453	-.7	1126	4.4	1647	1.3	2258	5.3

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 18

POINT MUGU TIDES
AUGUST 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0534	-.3	1154	5.0	1754	1.3	2339	4.9
2	0611	.5	1237	5.2	1904	1.3	----	---
3	0045	4.0	0648	1.2	1327	5.3	2033	1.2
4	0215	3.3	0732	1.8	1424	5.3	2213	.9
5	0429	3.0	0829	2.5	1530	5.4	2335	.4
6	0630	3.2	0959	2.8	1640	5.5	----	---
7	0038	0.0	0731	3.5	1125	2.9	1740	5.7
8	0126	-.3	0808	3.7	1225	2.8	1830	5.8
9	0205	-.5	0840	3.8	1310	2.6	1912	6.0
10	0237	-.5	0905	3.9	1348	2.4	1947	6.0
11	0307	-.5	0927	4.0	1424	2.2	2021	6.0
12	0332	-.4	0948	4.1	1456	2.0	2053	5.8
13	0356	-.2	1010	4.2	1528	1.9	2122	5.6
14	0419	.1	1032	4.4	1604	1.8	2156	5.2
15	0441	.5	1054	4.5	1642	1.7	2228	4.7
16	0459	.9	1118	4.5	1721	1.8	2302	4.1
17	0520	1.3	1144	4.6	1814	1.8	2344	3.6
18	0535	1.8	1216	4.6	1926	1.8	----	---
19	0051	3.0	0547	2.2	1255	4.6	2110	1.6
20	1402	4.7	2253	1.2	----	---	----	---
21	1527	4.9	2357	.6	----	---	----	---
22	0721	3.3	1005	3.2	1643	5.3	----	---
23	0041	0.0	0729	3.6	1132	2.9	1743	5.9
24	0121	-.5	0752	3.9	1230	2.4	1834	6.2
25	0156	-.9	0816	4.2	1322	1.9	1923	6.6
26	0232	-1.1	0847	4.6	1408	1.4	2009	6.6
27	0307	-1.0	0916	5.0	1458	1.0	2057	6.4
28	0341	-.6	0948	5.4	1547	.7	2146	6.0
29	0415	-.1	1023	5.6	1640	.5	2235	5.3
30	0449	.6	1102	5.7	1736	.5	2334	4.4
31	0521	1.2	1141	5.7	1845	.7	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 19

SAN NICOLAS ISLAND TIDES
AUGUST 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0531	-.3	1207	4.6	1751	1.2	2352	4.5
2	0608	.4	1250	4.8	1901	1.2	----	---
3	0058	3.7	0645	1.1	1340	4.8	2030	1.1
4	0228	3.0	0729	1.7	1437	4.8	2210	.8
5	0442	2.7	0826	2.3	1543	4.9	2332	.4
6	0643	2.9	0956	2.6	1653	5.0	----	---
7	0035	0.0	0744	3.2	1122	2.6	1753	5.2
8	0123	-.3	0821	3.4	1222	2.6	1843	5.3
9	0202	-.4	0853	3.5	1307	2.4	1925	5.5
10	0234	-.4	0918	3.6	1345	2.2	2000	5.5
11	0304	-.4	0940	3.7	1421	2.0	2034	5.5
12	0329	-.4	1001	3.8	1453	1.8	2106	5.3
13	0353	-.2	1023	3.9	1525	1.8	2135	5.1
14	0416	.1	1045	4.0	1601	1.7	2209	4.8
15	0438	.4	1107	4.1	1639	1.6	2241	4.3
16	0456	.8	1131	4.1	1718	1.7	2315	3.8
17	0517	1.2	1157	4.2	1811	1.7	2357	3.3
18	0532	1.7	1229	4.2	1923	1.7	----	---
19	0104	2.7	0544	2.0	1308	4.2	2107	1.5
20	1415	4.3	2250	1.1	----	---	----	---
21	1540	4.5	2354	.5	----	---	----	---
22	0734	3.0	1002	2.9	1656	4.8	----	---
23	0038	0.0	0742	3.3	1129	2.6	1756	5.4
24	0118	-.4	0805	3.6	1227	2.2	1847	5.7
25	0153	-.8	0829	3.9	1319	1.8	1936	6.1
26	0229	-1.0	0900	4.2	1405	1.3	2022	6.1
27	0304	-.9	0929	4.6	1455	.9	2110	5.9
28	0338	-.5	1001	4.9	1544	.6	2159	5.5
29	0412	-.1	1036	5.1	1637	.4	2248	4.8
30	0446	.5	1115	5.2	1733	.4	2347	4.0
31	0518	1.1	1154	5.2	1842	.6	----	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 20

POINT MUGU TIDES
SEPTEMBER 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0045	3.6	0558	2.0	1227	5.5	2010	.8
2	0236	3.1	0635	2.6	1332	5.2	2150	.7
3	0524	3.2	0757	3.1	1456	5.0	2316	.4
4	0642	3.6	1018	3.2	1623	5.1	----	---
5	0017	.1	0714	3.8	1141	3.0	1729	5.3
6	0102	-.1	0742	4.0	1233	2.6	1820	5.5
7	0137	-.2	0804	4.2	1313	2.3	1901	5.6
8	0205	-.1	0822	4.3	1344	1.9	1933	5.6
9	0228	0.0	0841	4.5	1414	1.6	2006	5.6
10	0251	.2	0856	4.7	1442	1.4	2037	5.4
11	0311	.4	0914	4.8	1514	1.2	2106	5.1
12	0329	.7	0933	5.0	1546	1.1	2138	4.7
13	0348	1.1	0952	5.1	1621	1.1	2212	4.3
14	0406	1.4	1016	5.1	1700	1.1	2248	3.7
15	0421	1.8	1038	5.1	1749	1.2	2339	3.3
16	0429	2.2	1110	5.0	1851	1.2	----	---
17	0108	2.8	0428	2.6	1150	4.9	2031	1.2
18	1302	4.7	2214	.9	----	---	----	---
19	1452	4.8	2322	.4	----	---	----	---
20	0645	3.6	1027	3.2	1621	5.1	0007	0.0*
21	0650	4.0	1137	2.7	1730	5.6	----	---
22	0046	-.4	0713	4.4	1230	1.9	1822	5.9
23	0123	-.5	0736	4.9	1316	1.2	1913	6.0
24	0155	-.5	0803	5.4	1402	.6	2000	6.0
25	0230	-.2	0834	5.8	1450	0.0	2049	5.7
26	0302	.2	0904	6.1	1536	-.3	2138	5.2
27	0334	.8	0939	6.2	1627	-.4	2233	4.5
28	0416	1.3	1015	6.1	1720	-.2	2334	3.9
29	0438	2.0	1054	5.9	1823	.1	----	---
30	0053	3.4	0507	2.6	1139	5.5	1942	.4

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 21

SAN NICOLAS ISLAND TIDES
SEPTEMBER 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0058	3.3	0555	1.8	1240	5.0	2007	.7
2	0249	2.8	0632	2.4	1345	4.8	2147	.6
3	0537	2.9	0754	2.8	1509	4.6	2313	.4
4	0655	3.3	1015	2.9	1636	4.7	----	---
5	0014	.1	0727	3.5	1138	2.7	1742	4.8
6	0059	-.1	0755	3.7	1230	2.4	1833	5.0
7	0134	-.2	0817	3.9	1310	2.1	1914	5.1
8	0202	-.1	0835	4.0	1341	1.8	1946	5.1
9	0225	0.0	0854	4.1	1411	1.5	2019	5.1
10	0248	.2	0909	4.3	1439	1.3	2050	4.9
11	0308	.4	0927	4.4	1511	1.1	2119	4.7
12	0326	.6	0946	4.6	1543	1.0	2151	4.3
13	0345	1.0	1005	4.7	1618	1.0	2225	4.0
14	0403	1.3	1029	4.7	1657	1.0	2301	3.4
15	0418	1.7	1051	4.7	1746	1.1	2352	3.0
16	0426	2.0	1123	4.6	1848	1.1	----	---
17	0121	2.6	0425	2.4	1203	4.5	2028	1.1
18	1315	4.3	2211	.8	----	---	----	---
19	1505	4.4	2319	.4	----	---	----	---
20	0658	3.3	1024	2.9	1634	4.7	0004	0.0*
21	0703	3.7	1134	2.5	1743	5.1	----	---
22	0043	-.4	0726	4.0	1227	1.8	1835	5.4
23	0120	-.4	0749	4.5	1313	1.1	1926	5.5
24	0152	-.4	0816	4.9	1359	.5	2013	5.5
25	0227	-.2	0847	5.3	1447	0.0	2102	5.2
26	0259	.2	0917	5.6	1533	-.3	2151	4.8
27	0331	.7	0952	5.7	1624	-.4	2246	4.1
28	0403	1.2	1028	5.6	1717	-.2	2347	3.6
29	0435	1.8	1107	5.4	1820	.1	----	---
30	0106	3.1	0504	2.4	1152	5.0	1939	.4

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 22
POINT MUGU TIDES
OCTOBER 1988
34 DEG 06 MIN N. 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0311	3.2	0546	3.1	1243	5.0	2118	.5
2	0535	3.5	0759	3.4	1420	4.6	2240	.5
3	0613	3.8	1034	3.3	1559	4.6	2340	.3
4	0638	4.1	1140	2.8	1708	4.7	----	---
5	0022	.2	0700	4.3	1226	2.3	1759	4.9
6	0054	.3	0718	4.5	1258	1.9	1839	5.0
7	0120	.4	0736	4.7	1330	1.4	1915	4.9
8	0142	.6	0752	5.0	1400	1.1	1950	4.9
9	0203	.6	0808	5.2	1430	.8	2022	4.7
10	0223	1.1	0824	5.4	1459	.5	2054	4.4
11	0241	1.3	0845	5.5	1531	.3	2132	4.1
12	0302	1.6	0905	5.6	1606	.3	2209	3.8
13	0320	2.0	0929	5.6	1648	.3	2258	3.5
14	0339	2.3	0957	5.5	1736	.5	----	---
15	0005	3.1	0350	2.6	1033	5.3	1841	.6
16	1117	5.1	2005	.7	----	---	----	---
17	1236	4.9	2130	.5	----	---	----	---
18	0544	3.6	0835	3.5	1426	4.6	2234	.2
19	0545	3.9	1031	3.0	1602	4.8	2324	.1
20	0604	4.4	1137	2.2	1711	5.0	0002	0.0*
21	0629	5.0	1228	1.3	1810	5.1	----	---
22	0041	.1	0654	5.5	1311	.5	1906	5.2
23	0116	.3	0723	6.0	1358	-.2	1956	5.0
24	0148	.7	0754	6.3	1442	-.7	2047	4.7
25	0227	1.1	0826	6.6	1527	-1.0	2140	4.4
26	0255	1.5	0901	6.5	1616	-1.0	2235	3.9
27	0330	2.0	0937	6.3	1708	-.7	2338	3.6
28	0402	2.5	1019	6.0	1806	-.3	----	---
29	0109	3.4	0438	2.9	1102	5.5	1914	.1
30	0309	3.4	0526	3.3	1202	4.9	2031	.3
31	0442	3.6	0746	3.5	1324	4.4	2144	.5

* -- TIDE OCCURS ON NEXT DATE
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 23
SAN NICOLAS ISLAND TIDES
OCTOBER 1988
33 DEG 13 MIN N. 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0324	2.9	0543	2.8	1256	4.6	2115	.4
2	0548	3.2	0759	3.1	1433	4.2	2237	.4
3	0626	3.5	1031	3.0	1612	4.2	2337	.3
4	0651	3.6	1137	2.6	1721	4.3	----	---
5	0019	.2	0713	4.0	1223	2.1	1812	.5
6	0051	.3	0731	4.1	1255	1.8	1852	4.6
7	0117	.4	0749	4.3	1327	1.3	1928	4.5
8	0139	.5	0805	4.6	1357	1.0	2003	4.5
9	0200	.7	0821	4.8	1427	.7	2035	4.3
10	0219	1.0	0837	4.9	1456	.4	2107	4.0
11	0237	1.2	0856	5.0	1529	.3	2145	3.8
12	0259	1.5	0918	5.1	1603	.3	2222	3.5
13	0317	1.8	0942	5.1	1645	.3	2311	3.2
14	0332	2.1	1010	5.0	1733	.4	----	---
15	0019	2.8	0347	2.4	1046	4.8	1838	.5
16	1130	4.7	2002	.6	----	---	----	---
17	1249	4.4	2127	.4	----	---	----	---
18	0557	3.3	0832	3.2	1439	4.2	2231	.2
19	0558	3.6	1028	2.7	1615	4.4	2321	.1
20	0617	4.0	1134	2.0	1724	4.6	2359	0.0
21	0642	4.6	1225	1.2	1823	4.7	----	---
22	0038	.1	0707	5.0	1308	.4	1919	4.8
23	0113	.3	0736	5.5	1355	-.2	2009	4.6
24	0145	.6	0807	5.8	1439	-.6	2100	4.3
25	0220	1.0	0839	6.1	1524	-.9	2153	4.0
26	0252	1.4	0914	6.0	1613	-.9	2248	3.6
27	0327	1.8	0950	5.8	1705	-.6	2351	3.3
28	0359	2.3	1031	5.5	1803	-.3	----	---
29	0122	3.1	0435	2.6	1115	5.0	1911	.1
30	0322	3.1	0523	3.0	1215	4.5	2026	.3
31	0455	3.3	0743	3.2	1337	4.0	2141	.4

* -- TIDE OCCURS ON NEXT DATE
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

POINT MUGU TIDES
NOVEMBER 1988

Table 26

POINT MUGU TIDES
DECEMBER 1988
34 DEG 06 MIN N, 119 DEG 06 MIN W OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0436	4.1	1032	2.6	1516	3.5	2207	1.1
2	0504	4.4	1135	2.0	1642	3.4	2247	1.3
3	0529	4.7	1217	1.4	1751	3.4	2324	1.6
4	0551	5.0	1257	.9	1847	3.4	2356	1.8
5	0617	5.3	1331	.3	1934	3.4	----	---
6	0025	2.0	0642	5.6	1406	-.1	2019	3.5
7	0054	2.1	0713	5.9	1441	-.5	2102	3.5
8	0129	2.2	0743	6.0	1517	-.8	2144	3.5
9	0204	2.3	0818	6.2	1556	-.9	2230	3.5
10	0240	2.4	0857	6.2	1638	-1.0	2315	3.5
11	0322	2.5	0939	6.1	1721	-.9	----	---
12	0009	3.5	0412	2.7	1024	5.9	1810	.7
13	0103	3.6	0518	2.8	1113	5.4	1859	.4
14	0155	3.8	0643	2.7	1219	4.7	1949	0.0
15	0248	4.2	0824	2.5	1338	4.0	2042	.5
16	0336	4.6	1002	1.8	1515	3.6	2132	1.0
17	0418	5.1	1119	1.1	1657	3.4	2224	1.3
18	0503	5.6	1220	.2	1818	3.4	2316	1.7
19	0545	6.0	1313	-.5	1925	3.5	0004	2.0*
20	0626	6.2	1358	-1.0	2024	3.6	----	---
21	0050	2.1	0708	6.4	1441	-1.2	2111	3.6
22	0135	2.2	0747	6.5	1523	-1.3	2155	3.6
23	0217	2.3	0828	6.4	1604	-1.2	2236	3.6
24	0259	2.4	0907	6.2	1641	-1.1	2318	3.6
25	0342	2.4	0942	5.9	1719	-.7	2357	3.6
26	0424	2.5	1024	5.5	1758	-.4	----	---
27	0039	3.6	0513	2.6	1100	4.9	1832	.1
28	0125	3.7	0613	2.7	1142	4.3	1906	.5
29	0210	3.8	0733	2.7	1235	3.7	1944	1.0
30	0252	4.0	0912	2.4	1353	3.1	2024	1.4
31	0338	4.2	1049	1.9	1546	2.7	2109	1.8

* -- TIDE OCCURS ON NEXT DATE
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 27

SAN NICOLAS ISLAND TIDES
DECEMBER 1988
33 DEG 13 MIN N, 119 DEG 27 MIN W BARGE BEACH

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0449	3.8	1029	2.4	1529	3.2	2204	1.0
2	0517	4.0	1132	1.8	1655	3.1	2244	1.2
3	0542	4.3	1214	1.3	1804	3.1	2321	1.5
4	0604	4.6	1254	.8	1900	3.1	2357	1.7
5	0630	4.8	1328	.3	1947	3.1	----	---
6	0022	1.8	0655	5.1	1403	-.1	2032	3.2
7	0051	1.9	0726	5.4	1438	-.4	2115	3.2
8	0126	2.0	0756	5.5	1514	-.7	2157	3.2
9	0201	2.1	0831	5.7	1553	-.8	2243	3.2
10	0237	2.2	0910	5.7	1635	-.9	2328	3.2
11	0319	2.3	0952	5.6	1718	-.8	----	---
12	0021	3.2	0409	2.5	1037	5.4	1807	.6
13	0116	3.3	0515	2.6	1126	4.9	1856	.4
14	0208	3.5	0640	2.5	1232	4.3	1946	0.0
15	0301	3.9	0821	2.3	1351	3.7	2039	.4
16	0349	4.2	0959	1.7	1528	3.3	2129	.9
17	0431	4.7	1116	1.0	1710	3.1	2221	1.2
18	0516	5.1	1217	.2	1831	3.1	2313	1.6
19	0556	5.5	1310	-.4	1936	3.2	0001	1.8*
20	0639	5.7	1355	-.9	2032	3.3	----	---
21	0047	1.9	0721	5.9	1436	-1.1	2124	3.3
22	0132	2.0	0800	6.0	1520	-1.2	2208	3.3
23	0214	2.1	0841	5.9	1601	-1.1	2249	3.3
24	0256	2.2	0920	5.7	1638	-1.0	2331	3.3
25	0339	2.2	0955	5.4	1716	-.6	0010	3.3*
26	0421	2.3	1037	5.0	1755	-.4	----	---
27	0052	3.3	0510	2.4	1113	4.5	1829	.1
28	0138	3.4	0610	2.5	1155	4.0	1903	.4
29	0223	3.5	0730	2.5	1248	3.4	1941	.9
30	0305	3.7	0909	2.2	1406	2.8	2021	1.3
31	0351	3.9	1046	1.8	1559	2.5	2106	1.7

* -- TIDE OCCURS ON NEXT DATE
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 28

Latitude [illegible]
Longitude [illegible]

Barking Sands Training Area, Kauai, Hawaiian Islands
Moonrise and Moonset for 1988

Hawaii-Aleutian Standard Time

Nautical Almanac Office
U.S. Naval Observatory
Washington, D.C. 20392-5100

	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
Day	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1	1615	0528	1746	0646	1726	0601	1841	0607	1917	0546	2113	0655	2141	0759	2215	1001	2257	1156	2330	1245	0010	1339	0035	1314
2	1707	0624	1839	0725	1817	0634	1933	0637	2017	0626	2210	0759	2224	0906	2252	1102	2347	1258		1338	0103	1413	0124	1343
3	1802	0717	1931	0800	1906	0705	2028	0710	2120	0712	2301	0906	2303	1010	2332	1203		1358	0027	1424	0154	1444	0213	1413
4	1857	0804	2021	0832	1956	0735	2125	0747	2222	0806	2346	1013	2340	1111		1304	0041	1453	0124	1505	0243	1514	0302	1444
5	1952	0847	2110	0902	2046	0804	2226	0829	2321	0905		1116		1211	0014	1405	0138	1542	0218	1540	0331	1543	0354	1519
6	2044	0925	2159	0932	2138	0835	2327	0916		1009	0026	1218	0016	1310	0101	1505	0234	1626	0309	1613	0420	1614	0449	1558
7	2135	0959	2250	1002	2233	0909		1011	0016	1115	0103	1317	0053	1409	0152	1603	0329	1705	0359	1643	0511	1646	0547	1643
8	2225	1030	2342	1033	2331	0947	0028	1111	0104	1220	0139	1416	0132	1510	0246	1656	0423	1739	0448	1713	0604	1723	0648	1735
9	2314	1100		1108		1030	0126	1216	0146	1322	0215	1515	0216	1611	0343	1744	0514	1811	0537	1742	0700	1803	0748	1833
10		1130	0039	1148	0032	1119	0219	1322	0225	1423	0252	1615	0304	1711	0439	1826	0603	1841	0626	1813	0759	1850	0847	1935
11	0004	1201	0139	1234	0134	1217	0306	1427	0302	1523	0333	1716	0356	1807	0534	1904	0652	1910	0718	1846	0859	1943	0940	2040
12	0056	1234	0242	1328	0235	1320	0348	1531	0338	1623	0419	1818	0452	1859	0627	1937	0741	1940	0811	1923	0958	2042	1029	2144
13	0151	1311	0346	1430	0333	1427	0427	1633	0415	1723	0509	1918	0549	1946	0717	2008	0830	2011	0907	2005	1054	2144	1112	2246
14	0250	1353	0449	1538	0425	1536	0504	1735	0455	1826	0603	2014	0645	2027	0807	2038	0922	2045	1006	2053	1144	2247	1151	2347
15	0354	1446	0546	1649	0512	1643	0542	1836	0538	1929	0700	2105	0740	2103	0855	2107	1016	2123	1105	2146	1230	2350	1227	
16	0501	1546	0637	1759	0554	1748	0620	1939	0626	2031	0758	2150	0832	2136	0944	2137	1112	2206	1203	2247	1312		1303	0046
17	0607	1654	0723	1906	0633	1851	0702	2043	0719	2130	0854	2229	0922	2206	1034	2209	1211	2257	1257	2350	1350	0052	1340	0145
18	0709	1805	0804	2011	0711	1954	0748	2146	0815	2224	0947	2304	1011	2236	1126	2244	1311	2353	1347		1427	0152	1420	0246
19	0804	1916	0842	2113	0749	2056	0838	2247	0912	2313	1039	2336	1059	2305	1222	2324	1409		1432	0054	1504	0252	1504	0348
20	0851	2025	0919	2214	0829	2159	0931	2344	1009	2355	1128		1149	2336	1320		1504	0056	1514	0158	1543	0353	1552	0452
21	0934	2129	0957	2315	0912	2302	1027		1103		1217	0006	1249		1422	0011	1554	0202	1553	0301	1625	0456	1646	0556
22	1012	2230	1037		0959		1124	0035	1156	0032	1306	0035	1335	0009	1523	0105	1639	0309	1631	0404	1712	0601	1745	0658
23	1048	2329	1120	0016	1049	0003	1219	0120	1246	0105	1357	0105	1433	0047	1622	0207	1721	0415	1709	0507	1804	0708	1845	0755
24	1124		1207	0116	1143	0101	1313	0159	1336	0136	1451	0138	1534	0131	1716	0314	1800	0520	1751	0611	1901	0812	1944	0845
25	1201	0028	1258	0214	1238	0154	1404	0234	1425	0206	1548	0214	1638	0223	1805	0423	1839	0624	1835	0716	2000	0913	2041	0929
26	1241	0129	1351	0309	1334	0242	1454	0307	1515	0236	1649	0255	1740	0322	1850	0531	1919	0728	1925	0823	2100	1007	2135	1007
27	1324	0229	1446	0359	1428	0324	1544	0337	1608	0308	1753	0343	1839	0428	1930	0638	2002	0833	2019	0929	2158	1054	2227	1041
28	1411	0329	1541	0445	1521	0401	1634	0407	1704	0342	1857	0439	1931	0537	2009	0743	2048	0939	2117	1031	2253	1135	2316	1113
29	1502	0426	1634	0525	1611	0435	1725	0438	1804	0420	1958	0542	2017	0647	2048	0846	2138	1044	2216	1128	2346	1211		1142
30	1556	0513			1701	0507	1819	0510	1906	0505	2053	0650	2059	0754	2127	0949	2233	1147	2314	1218		1243	0005	1212
31	1651	0602			1751	0537			2011	0556			2137	0859	2210	1052				1301			0053	1242

Table 29
PORT ALLEN TIDES
JANUARY 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0221	2.0	1015	.3	1339	.4	1919	-.1
2	0257	2.0	1050	.2	1424	.4	1956	-.1
3	0332	2.0	1126	.2	1506	.4	2032	-.1
4	0404	2.0	1151	.2	1543	.4	2110	-.1
5	0434	1.9	1217	.2	1625	.5	2142	0.0
6	0503	1.8	1245	.2	1708	.5	2221	.1
7	0533	1.7	1313	.2	1757	.6	2259	.3
8	0602	1.6	1338	.2	1859	.7	----	---
9	2348	.3*	0632	1.4	1403	.1	2005	.8
10	0051	.5	0702	1.2	1435	.1	2121	.9
11	0229	.7	0734	1.0	1507	.1	2227	1.2
12	0453	.7	0816	.8	1543	0.0	----	---
13	2327	1.4*	0710	.5	0925	.6	1628	0.0
14	0020	1.6	0822	.4	1058	.5	1714	-.1
15	0107	1.8	0908	.3	1221	.4	1810	-.2
16	0150	2.0	0946	.2	1323	.4	1900	-.3
17	0234	2.1	1018	.1	1416	.4	1951	-.3
18	0315	2.2	1053	0.0	1509	.5	2040	-.3
19	0356	2.2	1129	0.0	1559	.6	2129	-.2
20	0434	2.1	1201	-.1	1655	.7	2221	-.1
21	0513	2.0	1233	-.1	1750	.8	2316	.1
22	0549	1.7	1306	-.1	1851	.9	----	---
23	0017	.3	0627	1.4	1340	-.1	2002	1.0
24	0136	.5	0702	1.1	1415	-.1	2121	1.2
25	0334	.7	0738	.9	1454	-.1	2236	1.4
26	0621	.5	0816	.6	1540	0.0	----	---
27	2342	1.5	1633	0.0	----	---	----	---
28	0038	1.7	0903	.3	1139	.3	1728	0.0
29	0123	1.8	0935	.3	1253	.3	1823	-.1
30	0203	1.9	0959	.2	1344	.4	1909	-.1
31	0240	1.9	1022	.2	1425	.5	1951	-.1

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 30
PORT ALLEN TIDES
FEBRUARY 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0310	1.9	1044	.2	1500	.5	2030	-.1
2	0339	1.9	1103	.1	1535	.6	2108	0.0
3	0407	1.8	1124	.1	1611	.7	2144	0.0
4	0433	1.7	1145	.1	1646	.8	2219	.1
5	0454	1.5	1204	.1	1728	.9	230	.3
6	0519	1.4	1222	.1	1813	.9	----	---
7	2348	.3*	0545	1.2	1245	.1	1906	1.0
8	0053	.5	0606	1.0	1311	.1	2011	1.1
9	0228	.6	0631	.9	1344	0.0	2127	1.3
10	1429	0.0	2243	1.4	----	---	----	---
11	1530	0.0	----	---	----	---	----	---
12	2348	1.6*	0820	.3	1100	.3	1645	0.0
13	0041	1.8	0847	.2	1227	.3	1752	-.1
14	0129	2.0	0914	.1	1327	.5	1853	-.2
15	0214	2.0	0942	0.0	1416	.6	1949	-.3
16	0255	2.0	1011	-.1	1605	.8	2041	-.2
17	0330	2.0	1039	-.1	1550	.9	2135	-.2
18	0409	1.9	1108	-.1	1638	1.0	2229	0.0
19	0445	1.6	1135	-.1	1727	1.2	2323	.2
20	0517	1.4	1204	-.1	1820	1.3	----	---
21	0028	.3	0549	1.1	1233	-.1	1919	1.4
22	0150	.5	0617	.9	1305	-.1	2031	1.4
23	0359	.5	0642	.6	1342	0.0	2147	1.4
24	1434	.1	2303	1.5	----	---	----	---
25	1550	.1	----	---	----	---	----	---
26	0005	1.6	0834	.3	1159	.3	1702	.1
27	0056	1.6	0856	.2	1301	.4	1811	.1
28	0138	1.7	0913	.2	1340	.5	1904	0.0
29	0210	1.7	0931	.2	1415	.7	1949	0.0

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 31

PORT ALLEN TIDES
MARCH 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0241	1.7	0949	.1	1447	.8	2028	0.0
2	0307	1.6	1005	.1	1519	.9	2106	.1
3	0332	1.5	1021	.1	1552	.9	2145	.1
4	0357	1.4	1039	0.0	1624	1.1	2225	.2
5	0419	1.3	1057	0.0	1702	1.2	2311	.3
6	0444	1.1	1116	0.0	1741	1.3	----	---
7	0001	.3	0505	.9	1137	0.0	1829	1.4
8	0110	.4	0531	.8	1203	0.0	1925	1.4
9	0256	.5	0552	.6	1238	0.0	2038	1.4
10	1328	.1	2157	1.5	----	---	----	---
11	0716	.3	0908	.3	1450	.1	2311	1.6
12	0737	.2	1124	.3	1623	.1	----	---
13	0009	1.8	0801	.1	1233	.5	1749	0.0
14	0058	1.8	0828	0.0	1324	.7	1855	0.0
15	0144	1.8	0853	-.1	1410	.9	1954	-.1
16	0223	1.8	0920	-.1	1452	1.1	2050	-.1
17	0302	1.6	0947	-.2	1535	1.3	2145	0.0
18	0338	1.4	1012	-.2	1620	1.4	2239	.1
19	0412	1.2	1038	-.2	1706	1.5	2337	.2
20	0444	.9	1103	-.2	1751	1.5	----	---
21	0044	.3	0512	.8	1132	-.1	1843	1.5
22	0210	.4	0544	.6	1157	0.0	1942	1.5
23	0417	.3	0609	.4	1233	.1	2055	1.4
24	1331	.2	2211	1.4	----	---	----	---
25	0709	.3	1039	.3	1504	.3	2317	1.4
26	0731	.2	1201	.4	1643	.3	----	---
27	0010	1.5	0753	.2	1247	.6	1759	.3
28	0052	1.5	0811	.1	1322	.8	1852	.2
29	0127	1.4	0829	.1	1357	.9	1940	.2
30	0159	1.4	0847	.1	1429	1.0	2026	.2
31	0227	1.3	0903	0.0	1458	1.2	2108	.2

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 32

PORT ALLEN TIDES
APRIL 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0254	1.2	0919	0.0	1530	1.3	2150	.2
2	0318	1.1	0937	0.0	1601	1.4	2236	.2
3	0346	.9	0955	-.1	1637	1.5	2327	.3
4	0411	.8	1017	-.1	1715	1.5	----	---
5	0025	.3	0437	.6	1042	-.1	1803	1.6
6	0141	.3	0509	.5	1111	0.0	1900	1.6
7	0321	.3	0554	.4	1153	0.0	2006	1.6
8	0504	.3	0737	.3	1255	.1	2118	1.6
9	0600	.2	1006	.3	1429	.2	2228	1.6
10	0634	.1	1135	.5	1616	.3	----	---
11	2327	1.6*	0706	0.0	1231	.7	1747	.2
12	0020	1.5	0732	-.1	1317	.9	1856	.2
13	0106	1.4	0757	-.2	1359	1.2	2002	.1
14	0150	1.4	0825	-.2	1441	1.4	2102	.1
15	0229	1.2	0852	-.3	1519	1.6	2159	.1
16	0304	.9	0917	-.1	1601	1.7	2258	.2
17	0343	.8	0943	-.2	1643	1.8	----	---
18	2356	.2*	0418	.6	1008	-.2	1726	1.8
19	0105	.3	0453	.5	1036	-.1	1814	1.7
20	0219	.3	0529	.3	1108	0.0	1907	1.6
21	0352	.3	0624	.3	1143	.1	2005	1.5
22	0511	.3	0829	.3	1238	.2	2109	1.4
23	0549	.2	1033	.4	1411	.3	2209	1.4
24	0615	.2	1142	.6	1604	.4	2303	1.4
25	0640	.1	1224	.8	1730	.4	----	---
26	2349	1.3*	0701	.1	1300	.9	1837	.3
27	0031	1.2	0722	0.0	1332	1.1	1935	.3
28	0106	1.1	0741	0.0	1404	1.3	2025	.3
29	0139	1.0	0801	-.1	1435	1.4	2115	.3
30	0210	.9	0820	-.1	1507	1.6	2207	.2

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 33

PORT ALLEN TIDES
MAY 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0245	.8	0838	-.1	1542	1.7	2253	.2
2	0317	.6	0903	-.2	1620	1.8	----	---
3	2351	.2*	0349	.5	0935	-.2	1702	1.9
4	0051	.2	0424	.4	1007	-.1	1749	1.9
5	0156	.2	0520	.3	1045	-.1	1840	1.8
6	0309	.2	0640	.3	1134	0.0	1939	1.7
7	0408	.1	0833	.3	1243	.2	2040	1.6
8	0456	0.0	1018	.5	1426	.3	2143	1.5
9	0532	0.0	1127	.7	1616	.4	2239	1.4
10	0605	-.1	1219	1.0	1752	.4	----	---
11	2333	1.3*	0635	-.2	1305	1.3	1911	.3
12	0022	1.1	0704	-.2	1346	1.5	2022	.3
13	0111	.9	0732	-.3	1425	1.7	2125	.2
14	0153	.8	0801	-.3	1504	1.9	2221	.2
15	0236	.6	0829	-.3	1543	2.0	2319	.2
16	0317	.5	0858	-.2	1625	2.0	----	---
17	0012	.2	0356	.4	0928	-.2	1707	1.9
18	0108	.2	0438	.3	1000	-.1	1749	1.8
19	0206	.2	0531	.3	1035	0.0	1832	1.7
20	0259	.2	0639	.3	1117	.1	1917	1.6
21	0347	.2	0815	.3	1213	.3	2006	1.4
22	0426	.2	0951	.5	1326	.4	2056	1.4
23	0455	.1	1100	.7	1515	.5	2145	1.2
24	0523	.1	1148	.9	1656	.6	2234	1.1
25	0549	0.0	1227	1.1	1823	.5	2321	.9
26	0613	0.0	1306	1.3	1935	.4	----	---
27	0007	.9	0637	-.1	1338	1.5	2038	.3
28	0049	.7	0702	-.1	1413	1.7	2130	.3
29	0131	.6	0731	-.2	1449	1.9	2225	.2
30	0213	.5	0800	-.2	1527	2.0	2311	.2
31	0255	.4	0834	-.2	1606	2.0	----	---

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 34

PORT ALLEN TIDES
JUNE 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0000	.1	0341	.3	0911	-.2	1651	2.0
2	0049	.1	0433	.3	0955	-.2	1736	2.0
3	0140	.1	0537	.3	1043	-.1	1823	2.0
4	0229	0.0	0659	.4	1132	.1	1912	1.8
5	0311	0.0	0829	.5	1249	.3	2001	1.6
6	0351	-.1	0956	.8	1424	.5	2054	1.4
7	0429	-.1	1104	1.0	1621	.6	2145	1.2
8	0504	-.2	1208	1.3	1810	.5	2244	.9
9	0538	-.2	1249	1.5	1939	.4	----	---
10	2337	.8*	0613	-.2	1331	1.7	2051	.3
11	0036	.6	0646	-.3	1413	1.9	2153	.3
12	0131	.5	0723	-.2	1454	2.0	2242	.2
13	0216	.4	0755	-.2	1533	2.0	2332	.2
14	0302	.3	0831	-.2	1609	2.0	----	---
15	0014	.2	0345	.3	0906	-.1	1646	2.0
16	0049	.2	0432	.3	0944	-.1	1724	1.9
17	0128	.2	0521	.4	1023	.1	1800	1.8
18	0159	.2	0620	.4	1105	.2	1835	1.6
19	0234	.2	0732	.5	1154	.3	1911	1.5
20	0303	.1	0848	.7	1257	.5	1946	1.4
21	0332	.1	1003	.9	1429	.6	2025	1.2
22	0403	.1	1103	1.0	1630	.7	2109	.9
23	0431	0.0	1148	1.3	1823	.7	2205	.8
24	0502	0.0	1230	1.4	1951	.5	2304	.7
25	0536	-.1	1312	1.7	2053	.4	----	---
26	0006	.5	0615	-.1	1353	1.9	2141	.3
27	0105	.4	0654	-.2	1432	2.0	2224	.2
28	0155	.4	0736	-.2	1512	2.1	2303	.2
29	0249	.4	0822	-.3	1554	2.2	----	---
30	2345	.1*	0342	.4	0907	-.2	1633	2.1

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 35

PORT ALLEN TIDES
JULY 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0020	.1	0435	.5	0956	-.1	1716	2.0
2	0059	0.0	0538	.6	1048	0.0	1755	2.0
3	0134	0.0	0645	.7	1147	.3	1837	1.7
4	0211	0.0	0801	.9	1257	.4	1900	1.4
5	0248	-.1	0919	1.0	1436	.6	2002	1.2
6	0326	-.1	1036	1.3	1642	.7	2049	.9
7	0405	-.1	1135	1.5	1852	.6	2148	.7
8	0447	-.1	1230	1.7	2021	.4	2307	.5
9	0530	-.1	1318	1.9	2120	.3	----	---
10	0023	.4	0616	-.1	1401	2.0	2202	.3
11	0123	.4	0701	-.1	1440	2.0	2237	.3
12	0211	.4	0740	-.1	1517	2.0	2309	.2
13	0257	.4	0822	-.1	1551	2.0	----	---
14	2338	.2*	0338	.5	0901	0.0	1624	2.0
15	0003	.2	0419	.6	0936	.1	1653	1.9
16	0031	.2	0501	.6	1014	.2	1720	1.8
17	0053	.2	0551	.7	1057	.3	1750	1.6
18	0115	.2	0643	.8	1143	.4	1817	1.4
19	0142	.2	0742	.9	1241	.6	1843	1.3
20	0210	.2	0851	1.0	1411	.7	1914	1.1
21	0240	.2	0957	1.2	1623	.8	1946	.9
22	0315	.1	1106	1.4	1850	.6	2042	.7
23	0359	.1	1157	1.6	2012	.5	2218	.6
24	0451	0.0	1243	1.8	2053	.4	----	---
25	2351	.5*	0544	0.0	1331	2.0	2126	.3
26	0100	.5	0639	-.1	1412	2.1	2202	.2
27	0155	.5	0729	-.2	1454	2.2	2229	.2
28	0245	.6	0820	-.2	1534	2.2	2302	.1
29	0335	.7	0909	-.1	1611	2.1	2331	.1
30	0428	.9	1001	0.0	1650	2.0	----	---
31	0003	0.0	0524	.9	1057	.2	1725	1.8

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 36

PORT ALLEN TIDES
AUGUST 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0035	0.0	0622	1.1	1156	.3	1804	1.5
2	0107	0.0	0725	1.2	1312	.6	1839	1.3
3	0141	0.0	0837	1.4	1457	.7	1918	1.0
4	0220	.1	0953	1.5	1720	.7	2003	.8
5	0306	.1	1105	1.7	----	---	----	---
6	0359	.1	1205	1.8	2040	.4	2313	.5
7	0501	.1	1257	1.9	2108	.3	----	---
8	0038	.5	0600	.1	1343	2.0	2137	.3
9	0129	.6	0652	.1	1420	2.0	2202	.3
10	0211	.6	0738	.1	1454	2.0	2226	.3
11	0247	.7	0820	.1	1523	2.0	2242	.3
12	0326	.8	0855	.1	1551	1.9	2304	.3
13	0401	.9	0934	.2	1616	1.8	2322	.3
14	0433	.9	1013	.3	1641	1.6	----	---
15	2343	.3*	0515	1.0	1055	.4	1706	1.4
16	0001	.3	0557	1.1	1143	.5	1728	1.3
17	0022	.3	0645	1.2	1243	.7	1753	1.1
18	0046	.3	0745	1.3	1411	.8	1818	.9
19	0117	.3	0854	1.4	1641	.7	1833	.8
20	0159	.3	1013	1.5	----	---	----	---
21	0259	.3	1119	1.7	1957	.4	2227	.5
22	0415	.2	1217	1.9	2026	.3	----	---
23	2359	.6*	0528	.1	1304	2.0	2047	.3
24	0103	.7	0630	.1	1346	2.1	2116	.2
25	0153	.8	0729	0.0	1428	2.1	2141	.2
26	0239	.9	0821	0.0	1507	2.0	2209	.1
27	0324	1.1	0914	.1	1542	2.0	2238	.1
28	0411	1.3	1009	.2	1621	1.7	2303	.1
29	0500	1.4	1106	.3	1656	1.5	2335	.1
30	0553	1.5	1211	.4	1728	1.2	----	---
31	0003	.1	0649	1.6	1331	.6	1803	1.0

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 37

PORT ALLEN TIDES
SEPTEMBER 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0035	.1	0755	1.6	1529	.7	1835	.8
2	0113	.2	0913	1.7	----	---	----	---
3	0207	.3	1030	1.7	1932	.4	2158	.5
4	0320	.3	1135	1.8	2000	.4	----	---
5	2345	.6*	0442	.3	1229	1.9	2026	.3
6	0045	.7	0555	.3	1314	1.9	2047	.3
7	0127	.8	0647	.3	1350	1.9	2105	.3
8	0200	.9	0736	.3	1418	1.8	2123	.3
9	0233	1.0	0815	.3	1450	1.7	2141	.3
10	0307	1.1	0857	.3	1515	1.6	2159	.3
11	0339	1.3	0935	.3	1537	1.5	2215	.3
12	0409	1.4	1015	.4	1602	1.4	2234	.3
13	0442	1.4	1100	.4	1624	1.2	2252	.3
14	0521	1.5	1151	.6	1646	1.1	2310	.3
15	0607	1.5	1257	.7	1711	.9	2335	.3
16	0659	1.6	1433	.7	1736	.8	----	---
17	0006	.3	0805	1.6	----	---	----	---
18	0054	.3	0924	1.7	1845	.4	2045	.5
19	0214	.3	1039	1.8	1908	.4	2303	.6
20	0353	.3	1138	1.9	1930	.3	----	---
21	0010	.7	0519	.3	1228	2.0	1956	.3
22	0102	.8	0629	.3	1314	2.0	2022	.2
23	0143	1.1	0729	.2	1356	1.9	2048	.1
24	0230	1.4	0826	.2	1435	1.7	2113	0.0
25	0311	1.5	0925	.2	1511	1.5	2139	0.0
26	0354	1.7	1021	.3	1546	1.4	2207	0.0
27	0439	1.8	1121	.3	1624	1.1	2235	0.0
28	0525	1.9	1230	.4	1656	.9	2303	.1
29	0619	1.9	1354	.5	1734	.7	2332	.2
30	0719	1.8	1551	.5	1817	.6	----	---

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 38

PORT ALLEN TIDES
OCTOBER 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0009	.3	0828	1.8	1744	.4	2005	.5
2	0105	.3	0943	1.7	1835	.4	2239	.5
3	0237	.4	1047	1.7	1907	.3	----	---
4	2353	.7*	0420	.5	1143	1.7	1925	.3
5	0036	.9	0541	.4	1229	1.7	1947	.3
6	0112	1.0	0639	.4	1305	1.6	2005	.3
7	0147	1.1	0731	.4	1337	1.5	2021	.3
8	0213	1.3	0814	.4	1404	1.4	2039	.2
9	0245	1.4	0859	.4	1430	1.4	2055	.2
10	0313	1.5	0943	.4	1456	1.2	2113	.2
11	0345	1.6	1026	.4	1526	1.0	2131	.2
12	0417	1.7	1116	.4	1548	.9	2150	.2
13	0456	1.8	1212	.5	1617	.8	2215	.2
14	0538	1.8	1325	.5	1645	.7	2242	.2
15	0630	1.8	1458	.5	1725	.6	2318	.3
16	0733	1.8	1641	.4	1903	.5	----	---
17	0008	.3	0844	1.8	1733	.3	2140	.5
18	0141	.4	0951	1.8	1805	.3	2311	.7
19	0341	.4	1054	1.8	1832	.2	----	---
20	0007	.9	0517	.4	1146	1.7	1900	.1
21	0053	1.2	0633	.4	1233	1.6	1927	0.0
22	0135	1.4	0740	.3	1318	1.4	1953	0.0
23	0218	1.7	0841	.3	1359	1.3	2022	-.1
24	0256	1.9	0939	.3	1438	.3	2047	-.1
25	0338	2.0	1038	.3	1516	.9	2115	-.1
26	0420	2.0	1141	.3	1555	.8	2144	0.0
27	0505	2.0	1249	.3	1630	.6	2213	0.0
28	0554	2.0	1405	.3	1719	.5	2245	.1
29	0645	1.9	1532	.3	1821	.4	2324	.3
30	0741	1.8	1641	.3	2024	.4	----	---
31	0017	.3	0844	1.7	1723	.3	2227	.6

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 39
PORT ALLEN TIDES
NOVEMBER 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0151	.5	0945	1.6	1755	.3	----	---
2	2333	.8*	0341	.6	1041	1.5	1819	.3
3	0015	.9	0517	.6	1127	1.4	1839	.2
4	0050	1.1	0626	.6	1209	1.3	1900	.2
5	0122	1.3	0728	.5	1243	1.2	1919	.1
6	0154	1.5	0820	.5	1318	1.1	1940	.1
7	0224	1.6	0911	.4	1351	.9	2000	.1
8	0254	1.8	0957	.4	1422	.9	2021	0.0
9	0328	1.9	1047	.3	1454	.8	2046	0.0
10	0401	2.0	1135	.3	1526	.6	2110	0.0
11	0440	2.0	1230	.3	1605	.5	2144	0.0
12	0524	2.0	1333	.3	1649	.5	2216	.1
13	0612	2.0	1439	.3	1800	.4	2301	.2
14	0706	1.9	1537	.3	1945	.4	----	---
15	2356	.3*	0803	1.8	1623	.2	2140	.6
16	0133	.4	0902	1.7	1659	.1	2300	.9
17	0332	.6	1001	1.5	1733	0.0	----	---
18	2353	1.1*	0520	.6	1054	1.4	1802	0.0
19	0041	1.4	0645	.5	1152	1.2	1834	-.1
20	0123	1.7	0800	.4	1241	1.0	1905	-.2
21	0202	1.9	0905	.3	1330	.9	1935	-.2
22	0244	2.0	1004	.3	1412	.7	2005	-.2
23	0323	2.1	1100	.3	1457	.6	2037	-.2
24	0405	2.1	1156	.3	1537	.5	2110	-.1
25	0447	2.1	1248	.3	1625	.4	2144	0.0
26	0529	2.0	1347	.3	1715	.4	2222	.1
27	0614	2.0	1435	.3	1822	.4	2301	.2
28	0657	1.8	1521	.3	1948	.5	----	---
29	2353	.3*	0743	1.6	1600	.3	2128	.6
30	0102	.5	0829	1.4	1635	.2	2254	.8

* -- TIDE OCCURS ON PREVIOUS DATE.

Table 40
PORT ALLEN TIDES
DECEMBER 1988
21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0249	.7	0918	1.3	1703	.2	----	---
2	2338	1.0*	0445	.7	1007	1.2	1728	.1
3	0020	1.2	0618	.7	1058	1.0	1754	.1
4	0056	1.4	0733	.6	1147	.9	1821	0.0
5	0128	1.6	0835	.5	1232	.8	1846	0.0
6	0203	1.8	0926	.3	1318	.7	1914	-.1
7	0239	1.9	1013	.3	1357	.6	1943	-.1
8	0311	2.0	1101	.3	1435	.5	2017	-.1
9	0351	2.0	1143	.3	1521	.4	2053	-.1
10	0428	2.1	1226	.2	1607	.4	2131	-.1
11	0509	2.0	1308	.2	1703	.4	2217	0.0
12	0552	2.0	1352	.2	1814	.5	2303	.2
13	0635	1.9	1432	.1	1938	.6	----	---
14	0011	.3	0724	1.7	1514	0.0	2109	.8
15	0137	.5	0813	1.4	1553	0.0	2228	1.0
16	0337	.7	0906	1.2	1630	-.1	----	---
17	2330	1.3*	0539	.7	1004	1.0	1708	-.1
18	0022	1.5	0719	.5	1106	.8	1744	-.2
19	0111	1.8	0835	.4	1212	.6	1823	-.2
20	0153	2.0	0934	.3	1312	.5	1900	-.2
21	0235	2.1	1023	.2	1403	.4	1940	-.2
22	0314	2.1	1108	.2	1450	.4	2017	-.2
23	0353	2.1	1147	.2	1535	.4	2056	-.2
24	0430	2.0	1225	.2	1618	.4	2135	-.1
25	0504	2.0	1257	.2	1705	.4	2213	0.0
26	0540	1.9	1332	.2	1758	.5	2252	.2
27	0615	1.7	1405	.2	1901	.6	----	---
28	2338	.3*	0647	1.5	1433	.2	2015	.7
29	0037	.5	0719	1.4	1505	.1	2136	.9
30	0203	.7	0751	1.1	1535	.1	2242	1.0
31	0410	.8	0837	.9	1607	.1	----	---

* -- TIDE OCCURS ON PREVIOUS DATE.

APPENDIX A

HEIGHT OF THE TIDE AT ANY TIME*

The height of the tide at times intermediate to the times of high and low water is needed on occasion, and may be computed by either numerical or graphical methods. One example of each method is presented here, using the predicted tides for a day at Point Mugu.

Problem: Given that the predicted times and heights of the tides are:

Time	Height	Time	Height	Time	Height	Time	Height
0039	4.9	0814	0.2	1510	3.1	1933	2.4

Find the height of the tide at 0300.

Numerical Method

The duration of fall is $08^h\ 14^m - 00^h\ 39^m = 7^h\ 35^m$.

The time after high water for which the height is required is $03^h\ 00^m - 00^h\ 39^m = 02^h\ 21^m$.

The range of tide is 4.9 − 0.2 = 4.7 feet.

Entering table A-1 at the duration of fall of $7^h\ 40^m$, which is the nearest value to $7^h\ 35^m$, the nearest value on the horizontal line to $2^h\ 21^m$ is $2^h\ 18^m$ after high water. Following down this column to its intersection with a range of 4.5 feet which is the nearest tabular value to 4.7 feet, one obtains 0.9 which, being calculated from high water, must be subtracted from it. The approximate height at $03^h\ 00^m$ is, therefore, 4.9 − 0.9 = 4.0 feet.

When the duration of rise or fall is greater than $10^h\ 40^m$, enter the table with one-half the given duration and with one-half the time from the nearest high or low water, but if the duration of rise or fall is less than 4 hours, enter the table with double the given duration and with double the time from the nearest high or low water.

*This information is adapted from table 3 of the data source for this publication (see page 1).

Table A-1. Height of the Tide at Any Time

Duration of rise or fall, see footnote.

h m	Time from the nearest high water or low water															
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
4 00	0 08	0 16	0 24	0 32	0 40	0 48	0 56	1 04	1 12	1 20	1 28	1 36	1 44	1 52	2 00	
4 20	0 08	0 17	0 26	0 35	0 43	0 52	1 01	1 09	1 18	1 27	1 35	1 44	1 53	2 01	2 10	
4 40	0 09	0 19	0 28	0 37	0 47	0 56	1 05	1 15	1 24	1 33	1 43	1 52	2 01	2 11	2 20	
5 00	0 10	0 20	0 30	0 40	0 50	1 00	1 10	1 20	1 30	1 40	1 50	2 00	2 10	2 20	2 30	
5 20	0 11	0 21	0 32	0 43	0 53	1 04	1 15	1 25	1 36	1 47	1 57	2 08	2 19	2 29	2 40	
5 40	0 11	0 23	0 34	0 45	0 57	1 08	1 19	1 31	1 42	1 53	2 05	2 16	2 27	2 39	2 50	
6 00	0 12	0 24	0 36	0 48	1 00	1 12	1 24	1 36	1 48	2 00	2 12	2 24	2 36	2 48	3 00	
6 20	0 13	0 25	0 38	0 51	1 03	1 16	1 29	1 41	1 54	2 07	2 19	2 32	2 45	2 57	3 10	
6 40	0 13	0 27	0 40	0 53	1 07	1 20	1 33	1 47	2 00	2 13	2 27	2 40	2 53	3 07	3 20	
7 00	0 14	0 28	0 42	0 56	1 10	1 24	1 38	1 52	2 06	2 20	2 34	2 48	3 02	3 16	3 30	
7 20	0 15	0 29	0 44	0 59	1 13	1 28	1 43	1 57	2 12	2 27	2 41	2 56	3 11	3 25	3 40	
7 40	0 15	0 31	0 46	1 01	1 17	1 32	1 47	2 03	2 18	2 33	2 49	3 04	3 19	3 35	3 50	
8 00	0 16	0 32	0 48	1 04	1 20	1 36	1 52	2 08	2 24	2 40	2 56	3 12	3 28	3 44	4 00	
8 20	0 17	0 33	0 50	1 07	1 23	1 40	1 57	2 13	2 30	2 47	3 03	3 20	3 37	3 53	4 10	
8 40	0 17	0 35	0 52	1 09	1 27	1 44	2 01	2 19	2 36	2 53	3 11	3 28	3 45	4 03	4 20	
9 00	0 18	0 36	0 54	1 12	1 30	1 48	2 06	2 24	2 42	3 00	3 18	3 36	3 54	4 12	4 30	
9 20	0 19	0 37	0 56	1 15	1 33	1 52	2 11	2 29	2 48	3 07	3 25	3 44	4 03	4 21	4 40	
9 40	0 19	0 39	0 58	1 17	1 37	1 56	2 15	2 35	2 54	3 13	3 33	3 52	4 11	4 31	4 50	
10 00	0 20	0 40	1 00	1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00	4 20	4 40	5 00	
10 20	0 22	0 43	1 05	1 28	1 43	2 04	2 25	2 45	3 06	3 27	3 47	4 08	4 29	4 49	5 10	
10 40	0 21	0 43	1 04	1 25	1 47	2 08	2 29	2 51	3 12	3 33	3 55	4 16	4 37	4 59	5 20	

Range of tide, see footnote.

Ft	Correction to height															
	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	
1.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	
1.5	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.7	0.8	
2.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
2.5	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2	
3.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.8	0.9	1.0	1.2	1.3	1.5	
3.5	0.0	0.0	0.1	0.2	0.2	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.4	1.6	1.8	
4.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.4	1.6	1.8	2.0	
4.5	0.0	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.9	1.1	1.3	1.5	1.8	2.0	2.2	
5.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.8	1.0	1.2	1.5	1.7	2.0	2.2	2.5	
5.5	0.0	0.1	0.1	0.2	0.4	0.5	0.7	0.9	1.1	1.4	1.6	1.9	2.2	2.5	2.8	
6.0	0.0	0.1	0.1	0.3	0.4	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.7	3.0	
6.5	0.0	0.1	0.2	0.3	0.4	0.6	0.8	1.1	1.3	1.6	1.9	2.2	2.6	2.9	3.2	
7.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.2	1.4	1.8	2.1	2.4	2.8	3.1	3.5	
7.5	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.2	1.5	1.9	2.2	2.6	3.0	3.4	3.8	
8.0	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.3	1.6	2.0	2.4	2.8	3.2	3.6	4.0	
8.5	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4	1.8	2.1	2.5	2.9	3.4	3.8	4.2	
9.0	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.5	1.9	2.2	2.7	3.1	3.6	4.0	4.5	
9.5	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.6	2.0	2.4	2.8	3.3	3.8	4.3	4.8	
10.0	0.0	0.1	0.2	0.4	0.7	1.0	1.3	1.7	2.1	2.5	3.0	3.5	4.0	4.5	5.0	
10.5	0.0	0.1	0.3	0.5	0.7	1.0	1.3	1.7	2.2	2.6	3.1	3.6	4.2	4.7	5.2	
11.0	0.0	0.1	0.3	0.5	0.7	1.1	1.4	1.8	2.3	2.8	3.3	3.8	4.4	4.9	5.5	
11.5	0.0	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	2.9	3.4	4.0	4.6	5.1	5.8	
12.0	0.0	0.1	0.3	0.5	0.8	1.1	1.5	2.0	2.5	3.0	3.6	4.1	4.8	5.4	6.0	
12.5	0.0	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.6	3.1	3.7	4.3	5.0	5.6	6.2	
13.0	0.0	0.1	0.3	0.6	0.9	1.2	1.7	2.2	2.7	3.2	3.9	4.5	5.1	5.8	6.5	
13.5	0.0	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.4	4.0	4.7	5.4	6.0	6.8	
14.0	0.0	0.2	0.3	0.6	0.9	1.3	1.8	2.3	2.9	3.5	4.2	4.8	5.5	6.3	7.0	
14.5	0.0	0.2	0.4	0.6	1.0	1.4	1.9	2.4	3.0	3.6	4.3	5.0	5.7	6.5	7.2	
15.0	0.0	0.2	0.4	0.6	1.0	1.4	1.9	2.5	3.1	3.8	4.4	5.2	5.9	6.7	7.5	
15.5	0.0	0.2	0.4	0.7	1.0	1.5	2.0	2.6	3.2	3.9	4.6	5.4	6.1	6.9	7.8	
16.0	0.0	0.2	0.4	0.7	1.1	1.5	2.1	2.6	3.3	4.0	4.7	5.5	6.3	7.2	8.0	
16.5	0.0	0.2	0.4	0.7	1.1	1.6	2.1	2.7	3.4	4.1	4.9	5.7	6.5	7.4	8.2	
17.0	0.0	0.2	0.4	0.7	1.1	1.6	2.2	2.8	3.5	4.2	5.0	5.9	6.7	7.6	8.5	
17.5	0.0	0.2	0.4	0.8	1.2	1.7	2.2	2.9	3.6	4.4	5.2	6.0	6.9	7.8	8.8	
18.0	0.0	0.2	0.4	0.8	1.2	1.7	2.3	3.0	3.7	4.5	5.3	6.2	7.1	8.1	9.0	
18.5	0.1	0.2	0.5	0.8	1.2	1.8	2.4	3.1	3.8	4.6	5.5	6.4	7.3	8.3	9.2	
19.0	0.1	0.2	0.5	0.8	1.3	1.8	2.4	3.1	3.9	4.8	5.6	6.6	7.5	8.5	9.5	
19.5	0.1	0.2	0.5	0.8	1.3	1.9	2.5	3.2	4.0	4.9	5.8	6.7	7.7	8.7	9.8	
20.0	0.1	0.2	0.5	0.9	1.3	1.9	2.6	3.3	4.1	5.0	5.9	6.9	7.9	9.0	10.0	

Obtain from the predictions the high water and low water, one of which is before and the other after the time for which the height is required. The difference between the times of occurrence of these tides is the duration of rise or fall, and the difference between their heights is the range of tide for the above table. Find the difference between the nearest high or low water and the time for which the height is required.

Enter the table with the duration of rise or fall, printed in heavy faced type, which most nearly agrees with the actual value, and on that horizontal line find the time from the nearest high or low water which agrees most nearly with the corresponding actual difference. The correction sought is in the column directly below, on the line with the range of tide.

When the nearest tide is high water, subtract the correction.

When the nearest tide is low water, add the correction.

Graphical Method

If the height of the tide is required for a number of times on a certain day, the full tide curve for the day may be obtained by the *one-quarter, one-tenth rule*. The procedure is as follows:

1. On cross-section paper plot the high and low water points in the order of their occurrence for the day, measuring time horizontally and height vertically. These are the basic points for the curve.

2. Draw light straight lines connecting the points representing successive high and low waters.

3. Divide each of these straight lines into four equal parts. The halfway point of each line gives another point for the curve.

4. At the quarter point adjacent to high water, draw a vertical line above the point, and at the quarter point adjacent to low water, draw a vertical line below the point, making the length of these lines equal to one-tenth of the range between the high and low waters used. The points marking the ends of these vertical lines give two additional intermediate points for the curve.

5. Draw a smooth curve through the points of high and low waters and the intermediate points, making the curve well rounded near high and low waters. This curve will approximate the actual tide curve and heights for any time of the day may be readily scaled from it. The resulting graph is shown in figure A-1.

CAUTION

Both methods presented are based on the assumption that the rise and fall conform to simple cosine curves. Therefore the heights obtained will be approximate. The roughness of approximation will vary as the tide curve differs from a cosine curve.

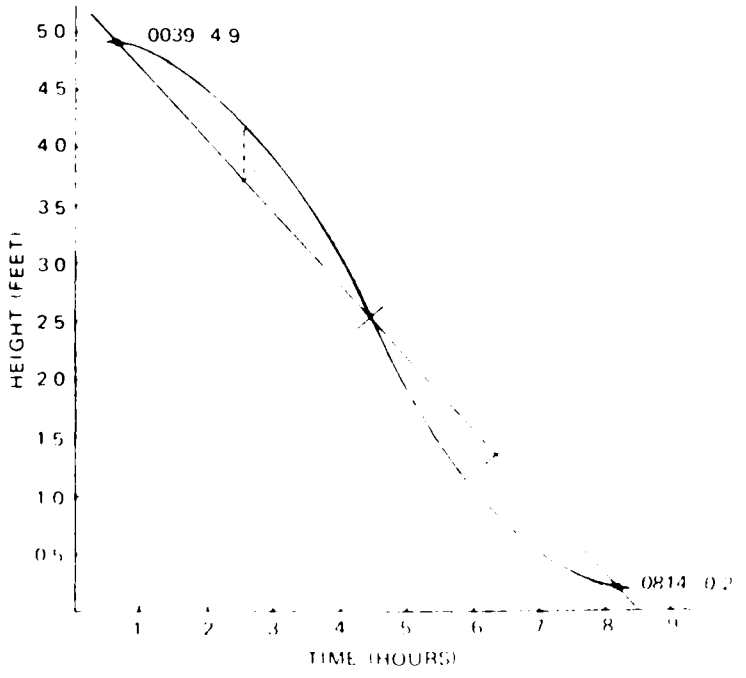

Figure A-1. Tidal Curve for Solution of the Problem

APPENDIX B

EQUINOXES, SOLSTICES, AND LUNAR PHASES 1988

The dates and times for Vernal and Autumnal Equinoxes and Summer and Winter Solstices during 1988 are listed in table B-1. The 1988 dates and times for phases of the moon are given in table B-2. Times are Pacific Standard Time; add 1 hour when Daylight Savings Time is in effect; add 2 hours for times in the Barking Sands area.

Table B-1. Equinoxes and Solstices, 1988, Point Mugu Area

Vernal Equinox	20 March	0139 PST	Beginning of Spring Day and night equal length
Summer Solstice	20 June	1957 PST	Beginning of Summer Greatest duration daylight
Autumnal Equinox	22 September	1129 PST	Beginning of Autumn Day and night equal length
Winter Solstice	21 December	0728 PST	Beginning of Winter Greatest duration darkness

Table B-2. Lunar Phases, 1988, Point Mugu Area

	JANUARY		FEBRUARY		MARCH		APRIL	
	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME
Full Moon	03	1740	02	1251	03	0801	02	0121
Last Quarter	11	2304	10	1501	11	0256	09	1121
New Moon	18	2126	17	0754	17	1802	16	0400
First Quarter	25	1353	24	0415	24	2041	23	1432

	MAY		JUNE		JULY		AUGUST	
	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME
Full Moon	01	1541	--	----	--	----	--	----
Last Quarter	08	1723	06	2221	06	0336	04	1022
New Moon	15	1411	14	0114	13	1353	12	0431
First Quarter	23	0849	22	0223	21	1814	20	0751
Full Moon	31	0253	29	1146	28	1925	27	0256

	SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME
Last Quarter	02	1950	02	0858	01	0211	--	----
New Moon	10	2049	10	1349	09	0620	08	2136
First Quarter	18	1918	18	0501	16	1335	15	2140
Full Moon	25	1107	24	2035	23	0753	22	2129
Last Quarter	--	----	--	----	30	2249	30	2057

Because the earth's period of revolution about the sun (365.24+ days) is not evenly divisible by the moon's period of revolution about the earth (27.32+ days), the dates and times of lunar phases, moonrise and moonset, and tidal data must be recomputed for each year. The following information, however, is based on geometrical relationships and holds true for all times:

1. The New Moon rises at sunrise, crosses the meridian at noon, and sets at sunset.

2. The First Quarter Moon rises at noon, crosses the meridian at sunset, and sets at midnight.

3. The Full Moon rises at sunset, crosses the meridian at midnight, and sets at sunrise.

4. The Last Quarter Moon rises at midnight, crosses the meridian at sunrise and sets at noon.

APPENDIX C

SUNRISE AND SUNSET TABLES

Sunrise, Sunset, and Duration of Twilight for Point Mugu, CA
34°07' N, 119°07' W

Note: All times are Pacific Standard Time (120th meridian); add 1 hour when Daylight Savings Time is in effect.

Date	January		February		March		April		May		June		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0702	1658	0654	1727	0626	1753	0544	1817	0507	1840	0446	1903	1
2	0703	1659	0653	1728	0624	1753	0543	1818	0506	1841	0446	1903	2
3	0703	1700	0652	1729	0623	1754	0541	1819	0505	1842	0445	1904	3
4	0703	1700	0652	1730	0622	1755	0540	1819	0504	1843	0445	1904	4
5	0703	1701	0651	1731	0621	1756	0539	1820	0503	1843	0445	1905	5
6	0703	1702	0650	1732	0619	1757	0537	1821	0502	1844	0445	1905	6
7	0703	1703	0649	1733	0618	1758	0536	1822	0502	1845	0445	1906	7
8	0703	1704	0648	1734	0617	1758	0535	1822	0501	1846	0444	1906	8
9	0703	1705	0647	1734	0615	1759	0533	1823	0500	1846	0444	1907	9
10	0703	1705	0647	1735	0614	1800	0532	1824	0459	1847	0444	1907	10
11	0703	1706	0646	1736	0613	1801	0531	1825	0458	1848	0444	1908	11
12	0703	1707	0645	1737	0611	1802	0530	1825	0457	1849	0444	1908	12
13	0703	1708	0644	1738	0610	1802	0528	1826	0456	1849	0444	1909	13
14	0702	1709	0643	1739	0609	1803	0527	1827	0456	1850	0444	1909	14
15	0702	1710	0642	1740	0607	1804	0526	1828	0455	1851	0444	1909	15
16	0702	1711	0641	1741	0606	1805	0525	1829	0454	1852	0444	1910	16
17	0702	1712	0640	1742	0605	1806	0523	1829	0453	1852	0444	1910	17
18	0701	1713	0638	1743	0603	1806	0522	1830	0453	1853	0445	1910	18
19	0701	1714	0637	1744	0602	1807	0521	1831	0452	1854	0445	1911	19
20	0701	1715	0636	1745	0601	1808	0520	1832	0451	1855	0445	1911	20
21	0700	1716	0635	1746	0559	1809	0518	1832	0451	1855	0445	1911	21
22	0700	1717	0634	1747	0558	1809	0517	1833	0450	1856	0445	1911	22
23	0659	1718	0633	1747	0556	1810	0516	1834	0450	1857	0446	1911	23
24	0659	1719	0632	1748	0555	1811	0515	1835	0449	1857	0446	1912	24
25	0658	1720	0630	1749	0554	1812	0514	1835	0449	1858	0446	1912	25
26	0658	1721	0629	1750	0552	1813	0513	1836	0448	1859	0446	1912	26
27	0657	1722	0628	1751	0551	1813	0512	1837	0448	1900	0447	1912	27
28	0657	1723	0627	1752	0550	1814	0511	1838	0447	1900	0447	1912	28
29	0656	1724	0626	1752	0548	1815	0509	1839	0447	1901	0447	1912	29
30	0655	1725			0547	1816	0508	1839	0447	1901	0448	1912	30
31	0655	1726			0546	1816			0446	1902			31
	Average twilight Civil: 27 min. Nautical: 58 min.		**Average twilight Civil: 26 min. Nautical: 55 min.**		**Average twilight Civil: 25 min. Nautical: 54 min.**		**Average twilight Civil: 26 min. Nautical: 57 min.**		**Average twilight Civil: 28 min. Nautical: 61 min.**		**Average twilight Civil: 29 min. Nautical: 65 min.**		

Date	July		August		September		October		November		December		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0448	1912	0507	1858	0530	1823	0551	1741	0616	1704	0644	1647	1
2	0449	1912	0508	1857	0530	1821	0551	1740	0617	1703	0645	1647	2
3	0449	1912	0509	1856	0531	1820	0552	1738	0618	1702	0646	1647	3
4	0450	1912	0510	1855	0532	1819	0553	1737	0619	1701	0646	1647	4
5	0450	1912	0510	1854	0532	1817	0554	1736	0620	1700	0647	1647	5
6	0451	1911	0511	1853	0533	1816	0554	1734	0621	1659	0648	1647	6
7	0451	1911	0512	1852	0534	1815	0555	1733	0621	1658	0649	1647	7
8	0452	1911	0512	1851	0535	1813	0556	1732	0622	1658	0650	1647	8
9	0452	1911	0513	1850	0535	1812	0557	1730	0623	1657	0650	1647	9
10	0453	1910	0514	1849	0536	1810	0557	1729	0624	1656	0651	1647	10
11	0453	1910	0515	1848	0537	1809	0558	1728	0625	1655	0652	1647	11
12	0454	1910	0515	1847	0537	1808	0559	1726	0626	1655	0653	1648	12
13	0454	1909	0516	1846	0538	1806	0600	1725	0627	1654	0653	1648	13
14	0455	1909	0517	1845	0539	1805	0601	1724	0628	1653	0654	1648	14
15	0456	1909	0518	1844	0539	1803	0601	1723	0629	1653	0655	1648	15
16	0456	1908	0518	1843	0540	1802	0602	1721	0630	1652	0655	1649	16
17	0457	1908	0519	1841	0541	1801	0603	1720	0631	1652	0656	1649	17
18	0458	1907	0520	1840	0541	1759	0604	1719	0632	1651	0657	1650	18
19	0458	1907	0520	1839	0542	1758	0605	1718	0633	1651	0657	1650	19
20	0459	1906	0521	1838	0543	1756	0606	1717	0634	1650	0658	1650	20
21	0500	1906	0522	1837	0544	1755	0606	1715	0635	1650	0658	1651	21
22	0500	1905	0523	1835	0544	1754	0607	1714	0636	1649	0659	1651	22
23	0501	1904	0523	1834	0545	1752	0608	1713	0637	1649	0659	1652	23
24	0502	1904	0524	1833	0546	1751	0609	1712	0637	1649	0700	1653	24
25	0502	1903	0525	1832	0546	1749	0610	1711	0638	1648	0700	1653	24
26	0503	1902	0525	1830	0547	1748	0611	1710	0639	1648	0700	1654	26
27	0504	1902	0526	1829	0548	1747	0611	1709	0640	1648	0701	1654	27
28	0504	1901	0527	1828	0549	1745	0612	1708	0641	1647	0701	1655	28
29	0505	1900	0528	1827	0549	1744	0613	1707	0642	1647	0702	1656	29
30	0506	1859	0528	1825	0550	1742	0614	1706	0643	1647	0702	1656	30
31	0507	1858	0529	1824			0615	1705			0702	1657	31
	Average twilight Civil: 29 min. Nautical: 63 min.		**Average twilight Civil: 26 min. Nautical: 58 min.**		**Average twilight Civil: 25 min. Nautical: 55 min.**		**Average twilight Civil: 25 min. Nautical: 56 min.**		**Average twilight Civil: 27 min. Nautical: 57 min.**		**Average twilight Civil: 28 min. Nautical: 59 min.**		

Retain for use in future years. These data valid through 2020.

Sunrise, Sunset, and Duration of Twilight for Barking Sands, Kauai, HI
22°02' N, 159°47' W

Note: All times are Alaska-Hawaii Standard Time (150th Meridian).

Date	January		February		March		April		May		June		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0718	1807	0718	1828	0700	1843	0632	1854	0607	1905	0555	1919	1
2	0719	1808	0717	1829	0659	1843	0631	1855	0607	1906	0555	1919	2
3	0719	1809	0717	1830	0659	1844	0630	1855	0606	1906	0555	1920	3
4	0719	1809	0716	1830	0658	1844	0629	1855	0606	1906	0555	1920	4
5	0719	1810	0716	1831	0657	1845	0628	1856	0605	1907	0555	1920	5
6	0720	1811	0715	1831	0656	1845	0627	1856	0604	1907	0555	1921	6
7	0720	1811	0715	1832	0655	1846	0627	1856	0604	1908	0555	1921	7
8	0720	1812	0714	1833	0654	1846	0626	1857	0603	1908	0555	1921	8
9	0720	1813	0714	1833	0653	1846	0625	1857	0603	1909	0555	1922	9
10	0720	1813	0713	1834	0653	1847	0624	1857	0602	1909	0555	1922	10
11	0720	1814	0713	1834	0652	1847	0623	1858	0602	1909	0555	1922	11
12	0721	1815	0712	1835	0651	1847	0622	1858	0601	1910	0555	1923	12
13	0721	1815	0712	1835	0650	1848	0621	1858	0601	1910	0555	1923	13
14	0721	1816	0711	1836	0649	1848	0620	1859	0600	1911	0555	1923	14
15	0721	1817	0710	1836	0648	1848	0620	1859	0600	1911	0555	1924	15
16	0721	1818	0710	1837	0647	1849	0619	1859	0559	1912	0555	1924	16
17	0721	1818	0709	1837	0646	1849	0618	1900	0559	1912	0556	1924	17
18	0721	1819	0709	1838	0645	1850	0617	1900	0559	1913	0556	1925	18
19	0721	1820	0708	1838	0644	1850	0616	1900	0558	1913	0556	1925	19
20	0720	1820	0707	1839	0643	1850	0615	1901	0558	1914	0556	1925	20
21	0720	1821	0706	1839	0642	1851	0615	1901	0558	1914	0556	1925	21
22	0720	1822	0706	1840	0641	1851	0614	1902	0557	1914	0557	1925	22
23	0720	1822	0705	1840	0641	1851	0613	1902	0557	1915	0557	1926	23
24	0720	1823	0704	1841	0640	1852	0612	1902	0557	1915	0557	1926	24
25	0720	1824	0703	1841	0639	1852	0612	1903	0557	1916	0557	1926	25
26	0719	1824	0703	1842	0638	1852	0611	1903	0556	1916	0558	1926	26
27	0719	1825	0702	1842	0637	1853	0610	1904	0556	1917	0558	1926	27
28	0719	1826	0701	1843	0636	1853	0609	1904	0556	1917	0558	1926	28
29	0719	1826	0701	1843	0635	1853	0609	1904	0556	1917	0558	1926	29
30	0718	1827			0634	1854	0608	1905	0555	1918	0559	1927	30
31	0718	1828			0633	1854			0555	1918			31
	Average twilight Civil: 24 min. Nautical: 51 min.		**Average twilight Civil: 23 min. Nautical: 49 min.**		**Average twilight Civil: 22 min. Nautical: 48 min.**		**Average twilight Civil: 23 min. Nautical: 50 min.**		**Average twilight Civil: 24 min. Nautical: 53 min.**		**Average twilight Civil: 25 min. Nautical: 55 min.**		

Date	July		August		September		October		November		December		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0559	1927	0611	1919	0622	1856	0630	1827	0643	1802	0702	1755	1
2	0559	1927	0612	1919	0622	1855	0631	1826	0643	1802	0702	1755	2
3	0600	1927	0612	1918	0623	1854	0631	1825	0644	1801	0703	1755	3
4	0600	1927	0612	1918	0623	1853	0631	1824	0645	1801	0703	1755	4
5	0600	1927	0613	1917	0623	1852	0632	1823	0645	1800	0704	1755	5
6	0601	1927	0613	1916	0623	1851	0632	1822	0646	1800	0705	1756	6
7	0601	1927	0614	1916	0624	1850	0632	1821	0646	1759	0705	1756	7
8	0602	1927	0614	1915	0624	1849	0633	1820	0647	1759	0706	1756	8
9	0602	1926	0614	1914	0624	1848	0633	1819	0647	1758	0707	1756	9
10	0602	1926	0615	1914	0625	1847	0633	1819	0648	1758	0707	1757	10
11	0603	1926	0615	1913	0625	1846	0634	1818	0649	1758	0708	1757	11
12	0603	1926	0616	1912	0625	1845	0634	1817	0649	1757	0709	1757	12
13	0603	1926	0616	1912	0625	1844	0634	1816	0650	1757	0709	1758	13
14	0604	1926	0616	1911	0626	1843	0635	1815	0650	1757	0710	1758	14
15	0604	1926	0617	1910	0626	1842	0635	1814	0651	1756	0710	1758	15
16	0605	1925	0617	1909	0626	1841	0636	1813	0652	1756	0711	1759	16
17	0605	1925	0617	1909	0626	1840	0636	1813	0652	1756	0712	1759	17
18	0606	1925	0618	1908	0627	1839	0636	1812	0653	1756	0712	1800	18
19	0606	1925	0618	1907	0627	1838	0637	1811	0654	1755	0713	1800	19
20	0606	1924	0618	1906	0627	1837	0637	1810	0654	1755	0713	1800	20
21	0607	1924	0619	1905	0628	1836	0638	1810	0655	1755	0714	1801	21
22	0607	1924	0619	1905	0628	1836	0638	1809	0656	1755	0714	1801	22
23	0608	1923	0619	1904	0628	1835	0639	1808	0656	1755	0715	1802	23
24	0608	1923	0620	1903	0628	1834	0639	1807	0657	1755	0715	1803	24
25	0608	1922	0620	1902	0629	1833	0639	1807	0658	1755	0716	1803	25
26	0609	1922	0620	1901	0629	1832	0640	1806	0658	1755	0716	1804	26
27	0609	1922	0621	1900	0629	1831	0640	1805	0659	1755	0716	1804	27
28	0610	1921	0621	1859	0630	1830	0641	1805	0700	1755	0717	1805	28
29	0610	1921	0621	1859	0630	1829	0641	1804	0700	1755	0717	1805	29
30	0610	1920	0621	1858	0630	1828	0642	1803	0701	1755	0718	1806	30
31	0611	1920	0622	1857			0642	1803			0718	1807	31
	Average twilight Civil: 25 min. Nautical: 54 min.		**Average twilight Civil: 23 min. Nautical: 50 min.**		**Average twilight Civil: 22 min. Nautical: 48 min.**		**Average twilight Civil: 23 min. Nautical: 49 min.**		**Average twilight Civil: 24 min. Nautical: 51 min.**		**Average twilight Civil: 24 min. Nautical: 52 min.**		

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